



Welcome to the MiniLumi System

Web site: <http://www.dnr-is.com/>
Email: support@dnr-is.com

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Contact us at: +972-2-570-0818

USA Toll-free number: 1-866-300-4286

email: support@dnr-is.com

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1 Introduction

The MiniLumi system is a semi-automated, versatile imaging workstation that supports both fluorescent and colorimetric (visible dyes) applications. The system includes the MiniLumi unit and GelCapture, an intuitive, easy-to-use acquisition and operation software, to provide a compact and fully integrated imaging solution.

The MiniLumi system is packaged with a CD containing both a Quick Reference Guide and this User Manual. To better utilize your system read Chapter 3 on Installing MiniLumi and GelCapture before proceeding with the rest of the manual. Once your system is installed and operational, you can then familiarize yourself with the system's different features and procedures.

Everything you need to know about your MiniLumi system is included in this manual. The highlighted chapter below contains information you may need to refer to in your day-to-day use of the MiniLumi system and is therefore also provided as a Quick Reference Guide for your convenience.

Chapter		Topics Covered
1	Introduction	An introduction to the manual and the topics covered in it
2	Overview	A brief look at the system's key features
3	Installing MiniLumi and GelCapture	A step-by-step guide for installing your system
4	Operating Instructions	Operating instructions from basic to advanced
5	Troubleshooting	A list of the most common issues and how to resolve each one
6	Glossary	A list of terms used in this guide and their meaning
7	Index	

2 Overview

The MiniLumi unit houses a high-resolution CCD camera which is fully controlled by the GelCapture software. The lens (zoom, iris and focus), illumination and filter wheel are controlled manually at the unit.

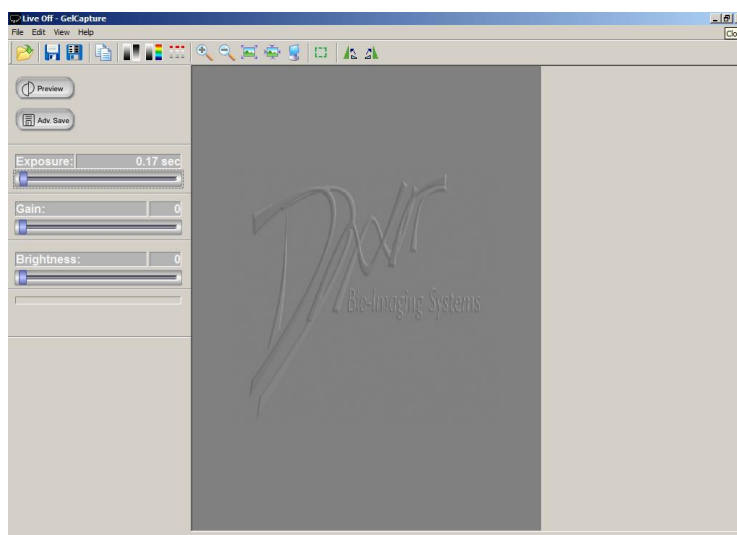
System Overview

The gel sample is placed inside the MiniLumi Unit. Imaging of the sample is controlled and monitored using both GelCapture (camera control) and the MiniLumi unit (manual lens, illumination and filter wheel controls). The sample image is previewed and saved and can then be exported to other software for analysis.



Insert a sample into the unit

Detect and acquire the sample's image



Analyze

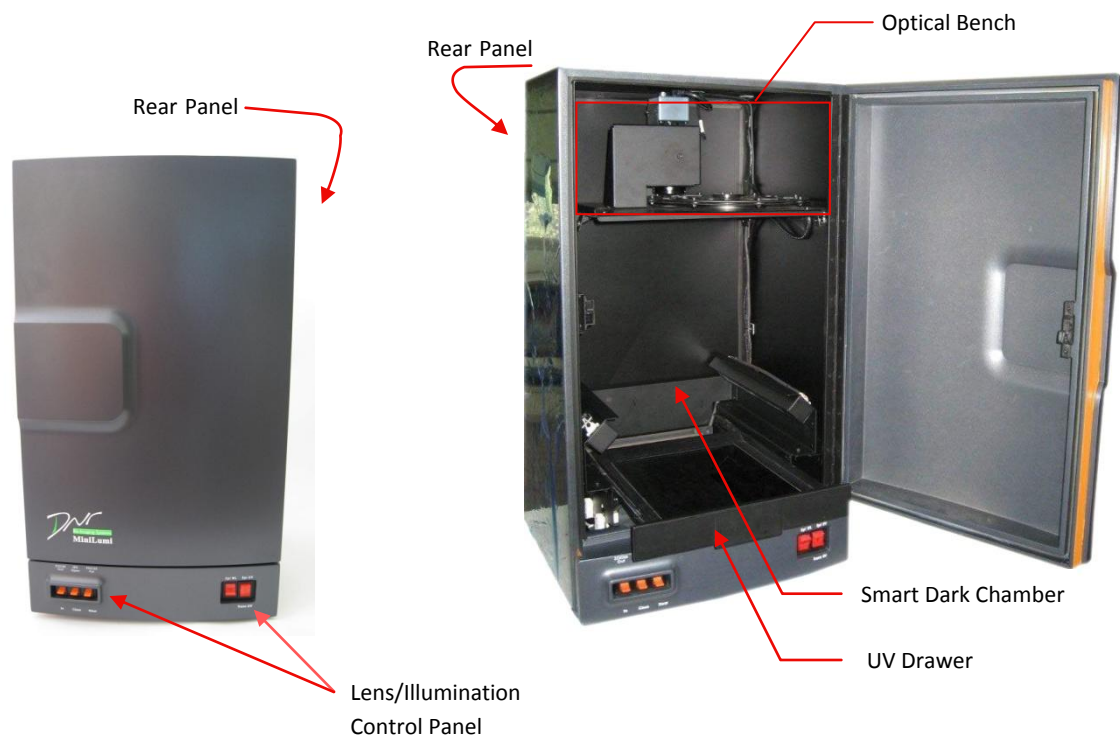
Features and Benefits

The key features that make MiniLumi the choice system for bio-imaging professionals include:

- Reliable fluorescence and colorimetric gel documentation system
- High resolution 1.4 and 2.0 Mp CCD Camera and 16-bit file format
- Semi-motorized high-speed zoom-lens (iris, focus and zoom)
- Enhanced sensitivity – maximum sample emitted light, minimal geometric and light distortion
- Smart Dark Chamber technology that automatically turns the illuminator off when the door is opened. This automated UV protection mechanism protects users from harmful UV radiation.
- Detailed sample viewing made available by real time high magnification
- Click-of-a-button software interface to perform most operations.

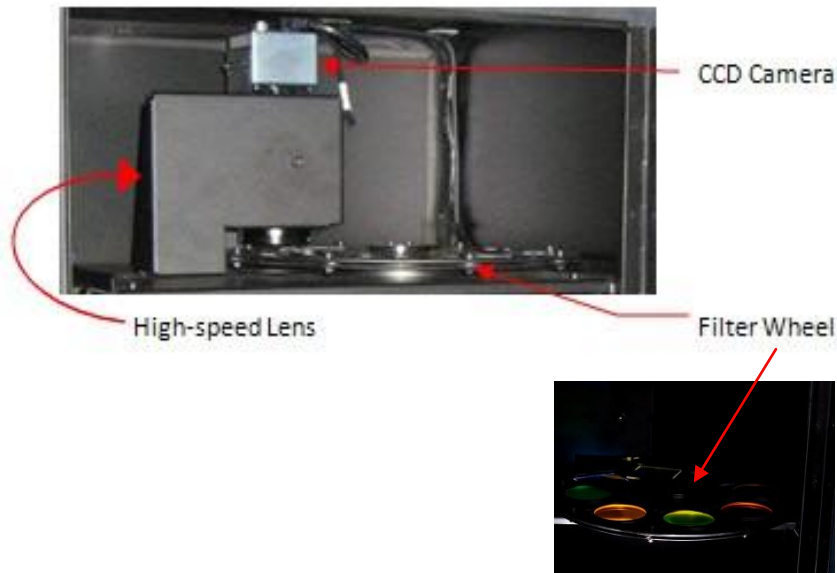
The MiniLumi Unit

The MiniLumi is a state of the art bio-imaging device with a 16-bit CCD camera. The unit has the following main sections: Optical Bench, Smart Dark Chamber, UV Drawer (all three are located inside the unit), the Lens/Illumination Control Panel on the front, and the Rear Panel at the back of the unit.



Optical Bench

The MiniLumi optical bench houses a quality CCD camera with a high-speed lens (both sealed by design) and the filter wheel. The lens is controlled semi-manually (iris, zoom and focus adjustments) using the UP/DOWN switches in the lens/illumination control panel.

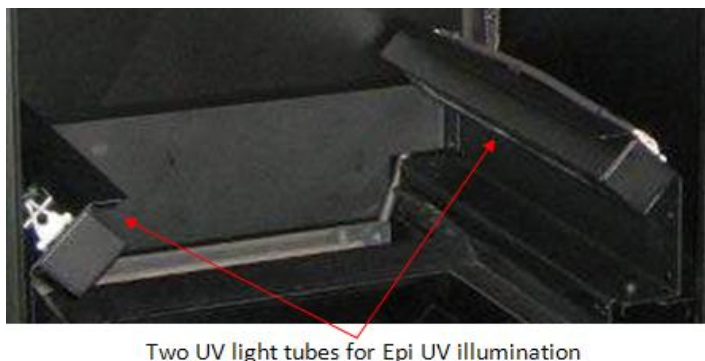


The filter wheel can be modified to eight different positions, which are set manually. Samples are usually stained with specific dyes to make certain areas visible. In order to make dyed area stand out, other wavelengths must be blocked or filtered out, thus the system only detects the light emitted from the dye-stained sample. The filter, which is used for blocking other wavelengths, is located just below the lens. The system supports many filters, and as standard is provided with orange and green filters. For more information about available filters, please contact your DNR representative.

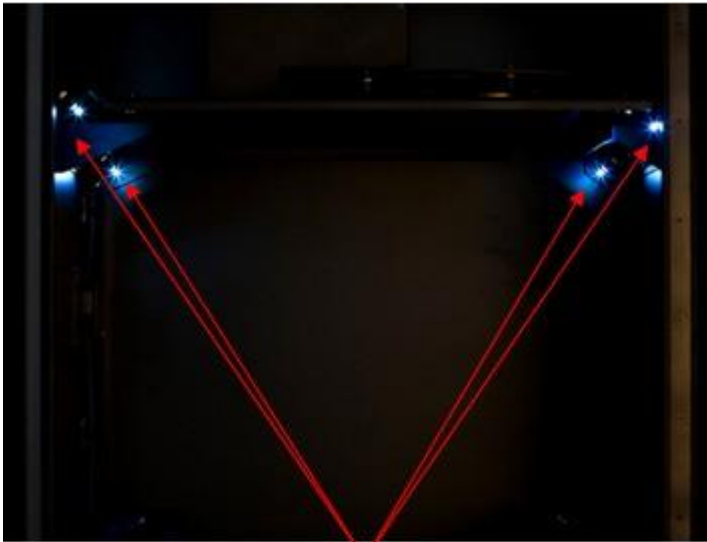
The Smart Dark Chamber

The Smart Dark Chamber houses the following lights for different illumination options:

- Two UV light tubes for Epi UV illumination (optional), located above and on either side of the UV Drawer

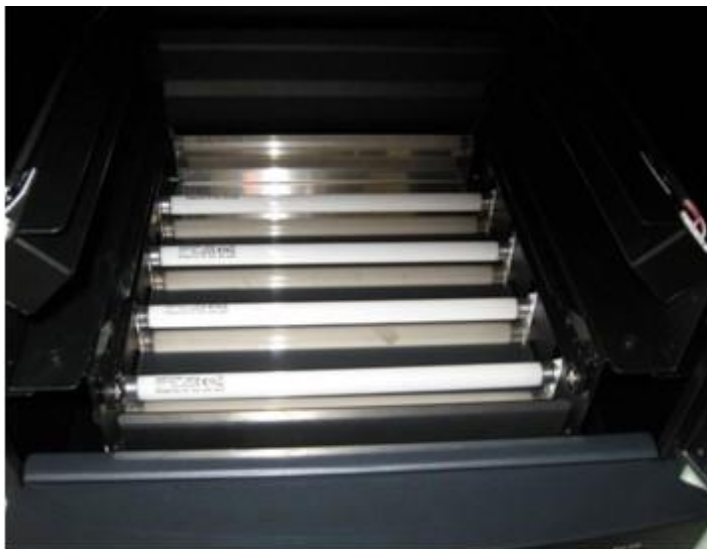


- Four White Light LEDs for Epi WL illumination, located in four corners and above the UV lights



Four White Light LEDs for Epi WL illumination

- Four UV light tubes for Trans UV illumination, located underneath the UV Drawer



Four UV light tubes for Trans UV illumination

When the drawer is inserted correctly and the unit door is properly closed the Smart Dark Chamber becomes completely light-proof. The chamber is specifically designed with a user safety mechanism that automatically turns the UV lights off if the MiniLumi door is opened. This safety feature is particularly important, due to known risks of UV radiation, and therefore places MiniLumi at an advantage point.

UV Drawer

The UV drawer slides in to fit snugly in its niche and can be pulled out fully, which is a very helpful when cleaning the drawer surface or when needing to change a light tube. The drawer is specifically designed with anti-spill borders, to prevent samples and sample buffers from spilling into the unit.

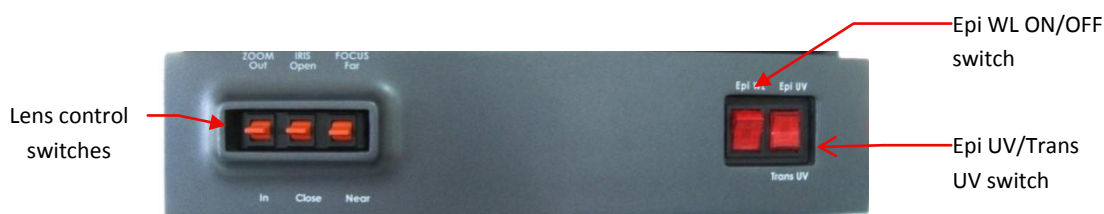


UV Drawer

Lens and Illumination Control Panel

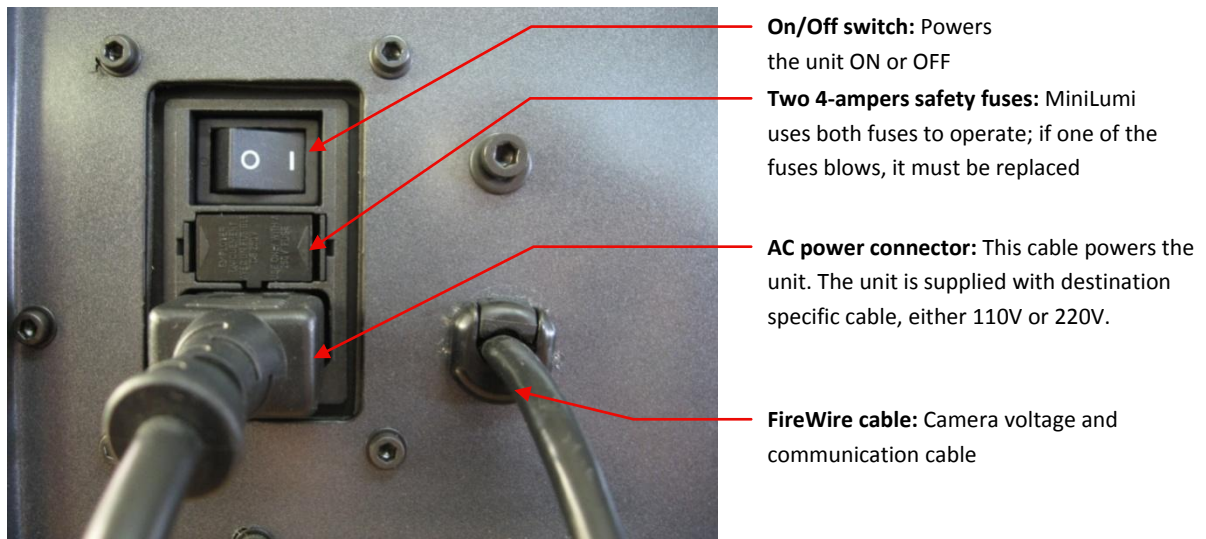
The lens controls include zoom, iris and focus switches which are located on the left side of the panel. The Illumination control switches on the right side of the panel include a Trans UV / Epi UV switch and an Epi WL ON/OFF switch, all designed to allow fast and accurate operation.

For opaque samples, only Epi-illumination should be turned on. For transparent samples, either Epi illumination (WL/UV) or Trans UV illumination can be used.



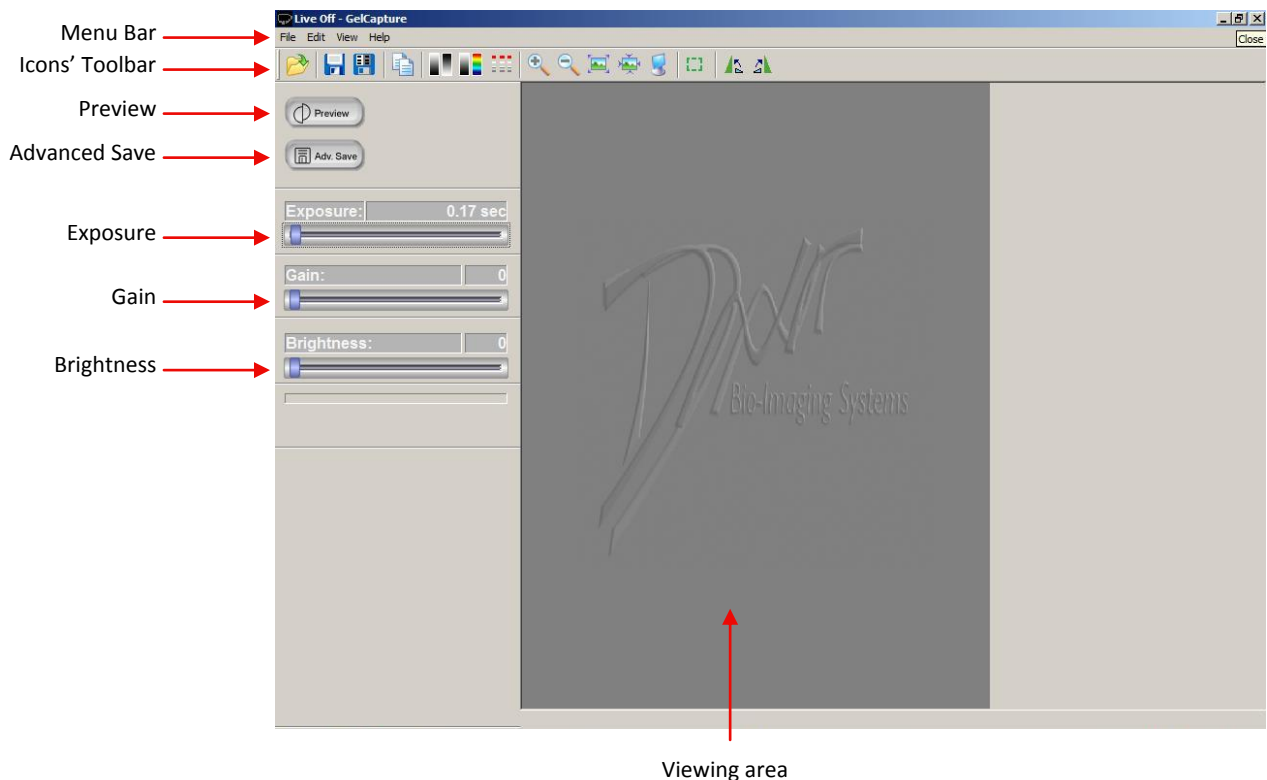
Rear Panel

The power connection, safety fuses and cables are all located in the rear panel of the unit.



GelCapture

The GelCapture application seamlessly integrates with the MiniLumi unit, thereby giving you complete control of configuration, capturing and saving sample images on your PC for analysis. The friendly GUI lets you perform common actions with a single click of a button or icon. The following image displays the application's main screen.


















Application Features

Menu Bar:	The drop-down menus contain all of the software's features
Icons' Toolbar:	Commonly used functions can be triggered with a click of an icon from the top toolbar
Preview:	Preview the image in live mode, make adjustments before capturing, or save the image from Preview mode
Adv. Save	Enables capturing a sequence of images using hardware Integration
Exposure Time:	Sets the exposure time
Gain:	Camera feature that increases or decreases the strength of an electrical signal
Brightness:	Enables to brighten the image
Viewing Area:	The captured image appears here

Icons

The most commonly used functions can easily be accessed with a single click of an icon.

Icon	Name	To
	Open Image	Open a previously captured and saved TIFF image
	Save	Save the image
	Save Image with Reference	Save one image of a sample that was dyed with both fluorescent and visible dyes
	Copy	Copy the image to the clipboard. You can then paste the image in a number of Windows applications
	Invert Image	Display an inverse version of the image
	Pseudo-color	Show the image in Pseudo-colors
	Over-Exposure	Show/hide overexposed areas in red
	Zoom In	Zoom into the image
	Zoom Out	Zoom out of the image
	Actual Pixels	Display the actual image size
	Fit to Window	Resize the image to fit in the viewing area
	Full Screen	Display the image on the entire screen. To return to GelCapture's main screen press [Esc]
	Region of Interest	Select a specific area to work on within the image
	Rotate Left	Rotate the image counterclockwise
	Rotate Right	Rotate the image clockwise

3 Installing MiniLumi and GelCapture

This chapter explains all the steps required for proper installation of your system and includes safety requirements, maintenance, PC requirements, software installation and more. Once you have completed these steps, your MiniLumi should be completely operational.

GelCapture installation instructions for Windows Vista Business Operating System are provided on page 18.

The camera driver installation instructions for Windows Vista Business Operating System are provided on page 25.

Safety Requirements

- When connecting the FireWire cable (from the unit) to the FireWire card (installed in PC), **pay close attention to the cable connector shape at the unit end, and connect it properly.**
- IMPROPER CONNECTION WILL RESULT IN IRREVERSIBLE DAMAGE TO THE CAMERA.
- Ensure the AC power outlet is properly grounded to protect both the personnel and the equipment
- Verify that all devices are turned off before making any connections
- Place the MiniLumi unit at least 30 cm (12 inches) away from walls and ceiling
- **Do not store below 2°C.** The recommended operating conditions for MiniLumi are 25°C±5 (78°F±15.5) and 55% relative humidity. Maximum ambient temperature: 28°C; maximum ambient humidity: 80%
- Do not store the system in direct sunlight or in the direct flow of the air conditioner
- Do not clean the system with harmful solvents. Only use a soft cloth dampened with water and then with 70% Ethanol
- Only use a 4A fuse for an acceptable range of 100-240V
- Do not open the unit. Due to the danger of exposure to high voltage, only trained service technicians should open the unit
- Do not place the system near any motorized, vibrating or magnetic equipment
- Unit protection can be impaired if used in a manner not specified by the manufacturer

Maintenance

To keep the MiniLumi unit in good working order, observe the following guidelines:

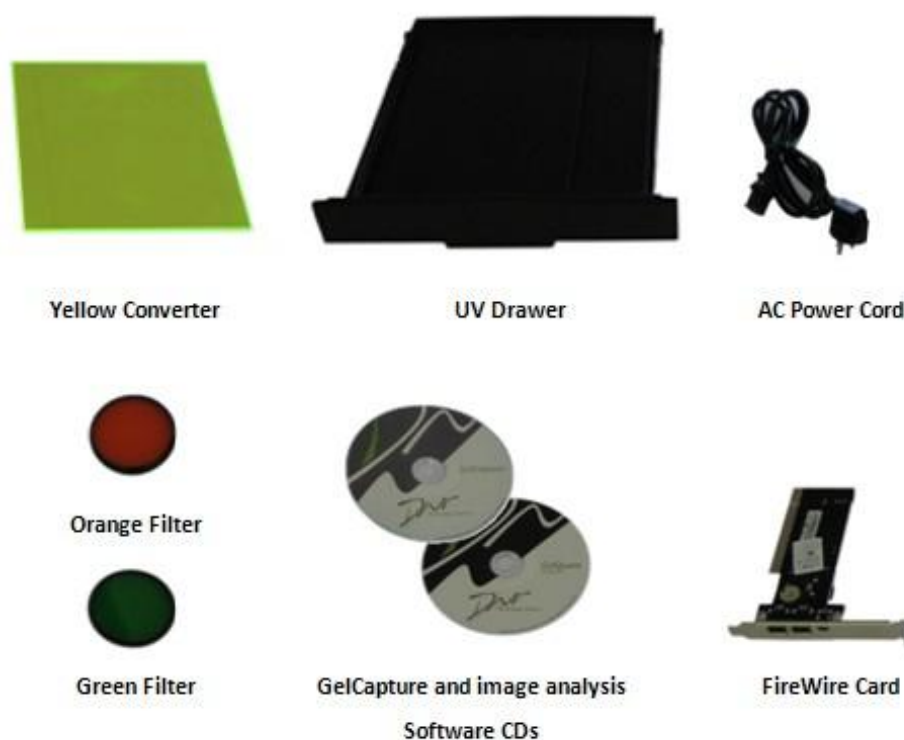
- The UV drawer must be cleaned every time a sample is removed. Use a soft non-abrasive, lint-free cloth. First dampen with water and then with 70% Ethanol
- To clean MiniLumi surface, first use the cloth dampened with water and then dampened with 70% Ethanol
- Do not operate while wearing gloves with talcum
- Calibrate the camera once a year, as described in the Camera Calibration section
- Clean the filters annually with appropriate lens paper

Note: Turn the power off before any maintenance is performed.

Out of the Box

The packaging includes the following items:

- 1 MiniLumi unit
- 2 FireWire card
- 3 Camera (FireWire) cable (pre-connected to the unit)
- 4 AC power cord (European/N. America compatible)
- 5 UV drawer
- 6 Yellow converter
- 7 Orange filter
- 8 Green filter
- 9 GelCapture and image analysis software CDs



Minimum PC Requirements

It is important to follow the recommended specifications to attain optimal software performance and reduce installation and operational issues. In order to install and operate both the MiniLumi unit and GelCapture software, you must have the following:

- Processor: Pentium Core due, 1.6 GHz
- Memory: Minimum 512 MB RAM
- OS: Windows XP Pro (English version) OR English Windows Vista Business version
- Minimum monitor resolution: 1024 x 768 pixels (recommended)

Note: When the software is running, the more RAM a PC has the better.

MiniLumi is based on FireWire technology. A FireWire card is provided with the system you purchased, and must be installed onto the PC that GelCapture will run on.

Hardware Setup

- 1 The system must be switched OFF until you are instructed to turn it ON.
- 2 Install the FireWire card and its drivers into your computer.
- 3 Place the filter in the filter wheel.
- 4 On the rear panel of the MiniLumi unit, connect the power cord to the wall socket.

Note: Connect the FireWire cable **ONLY AFTER** GelCapture is installed.

Software Installation

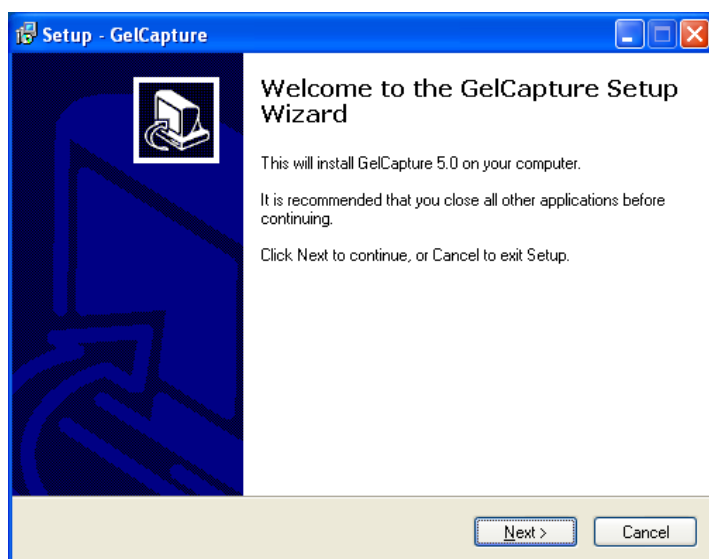
After successful hardware setup and installation, proceed to install the following software:

- Install GelCapture from the CD (Windows XP Pro, page 15/Windows Vista Business, page 18)
- Install the camera drivers (Windows XP Pro, page 22/Windows Vista Business, page 25)

Installing GelCapture from CD (Windows XP Pro)

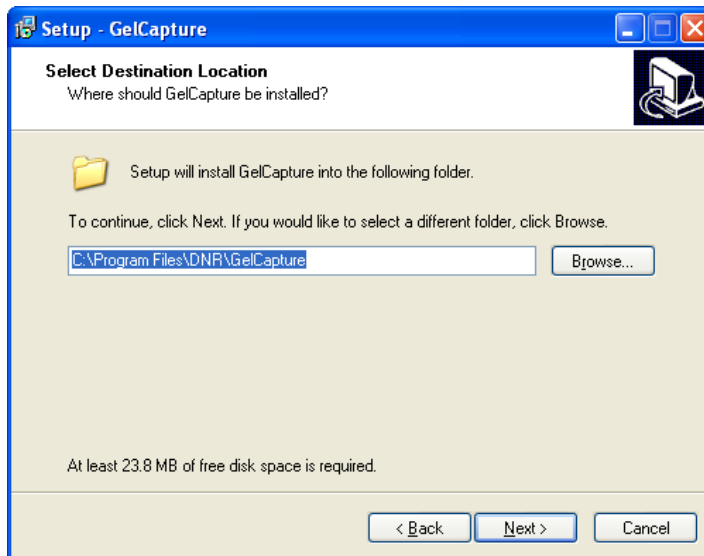
Note: Before starting installation, verify that you are logged in as Administrator.

- 1 Insert the installation CD into the disk drive. The installation wizard starts automatically. In the Welcome window click Next to continue.

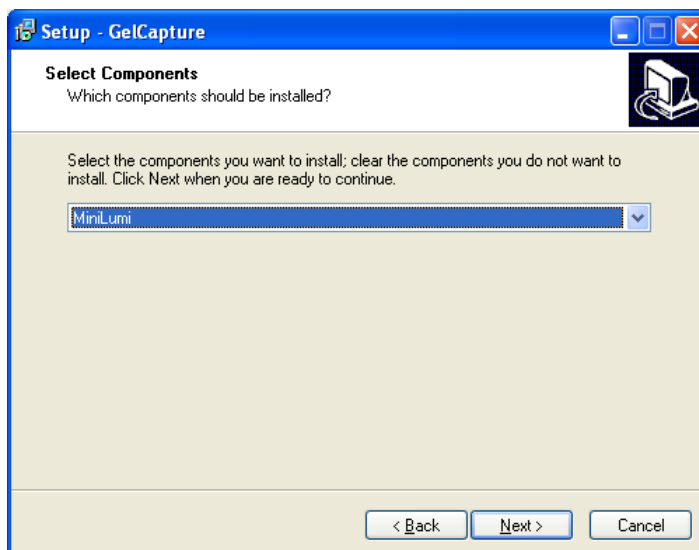


3: Installing MiniLumi and GelCapture

- 2 In the Select Destination Location window, select the preferred destination to install to, or click Next to continue. By default, the system is installed to: C:\Program Files\DNR\GelCapture.

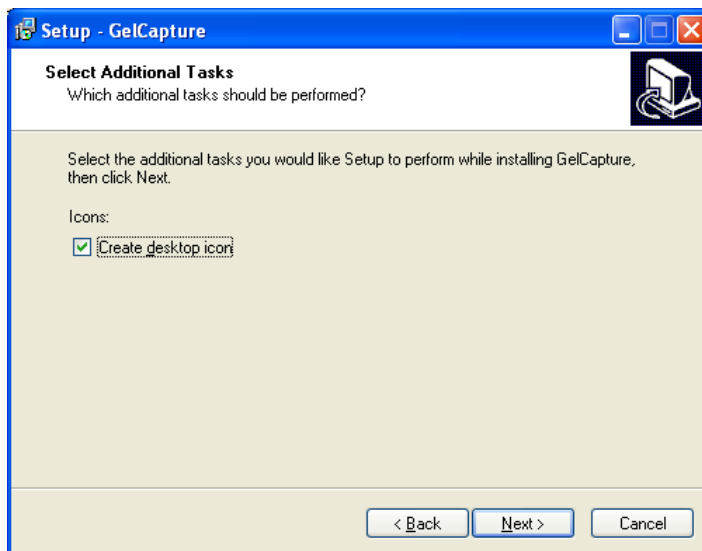


- 3 From the drop down menu, select MiniLumi and click Next.

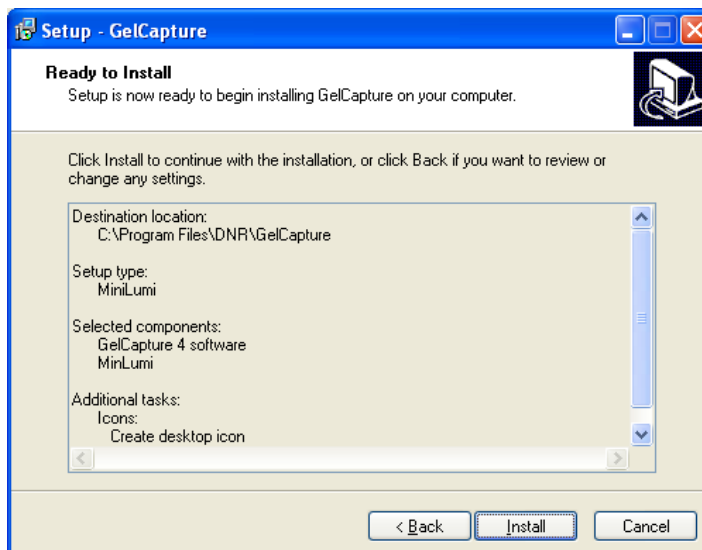


3: Installing MiniLumi and GelCapture

- 4 In the Select Additional Tasks window, choose if you want to create a GelCapture desktop icon. Click Next to continue installation.

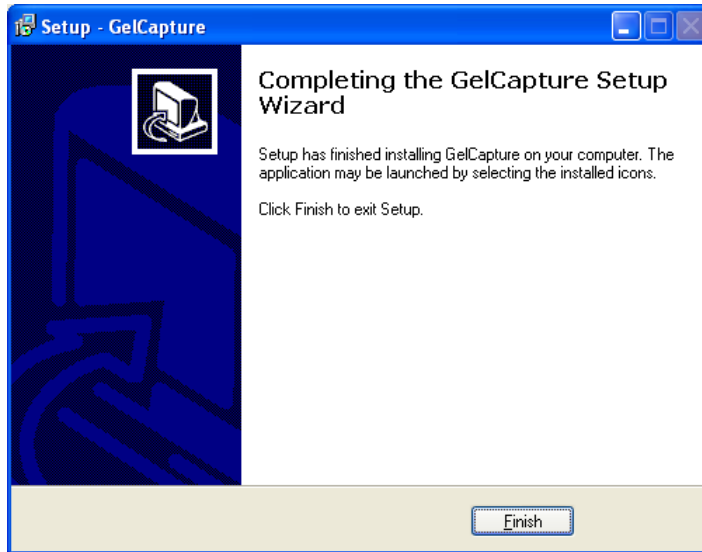


- 5 Verify that the installation information is correct before you click Install.



3: Installing MiniLumi and GelCapture

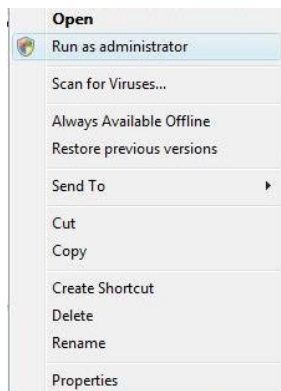
- 6 Once installation is completed, click Finish to exit Setup.



Installing GelCapture from CD (Windows Vista Business OS)

To install GelCapture (Windows Vista Business OS)

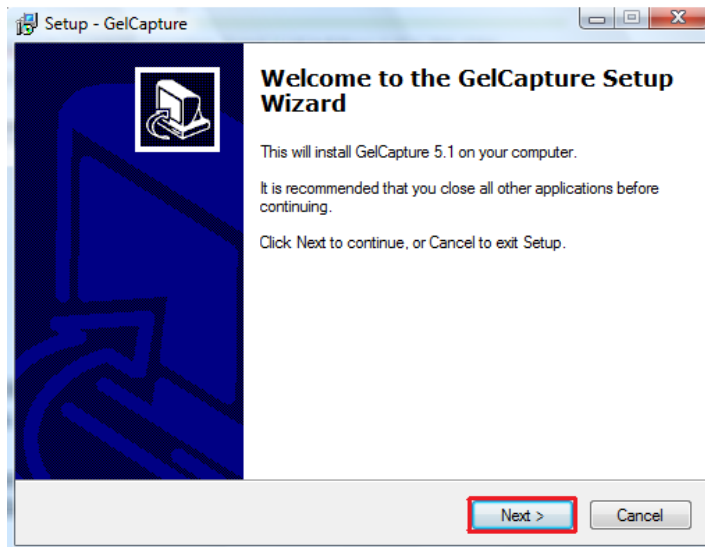
- 1 In the CD, right-click the installation file: GelCaptureVistaSetup.exe and select “Run as administrator”. The drop down list will close after the selection is made.



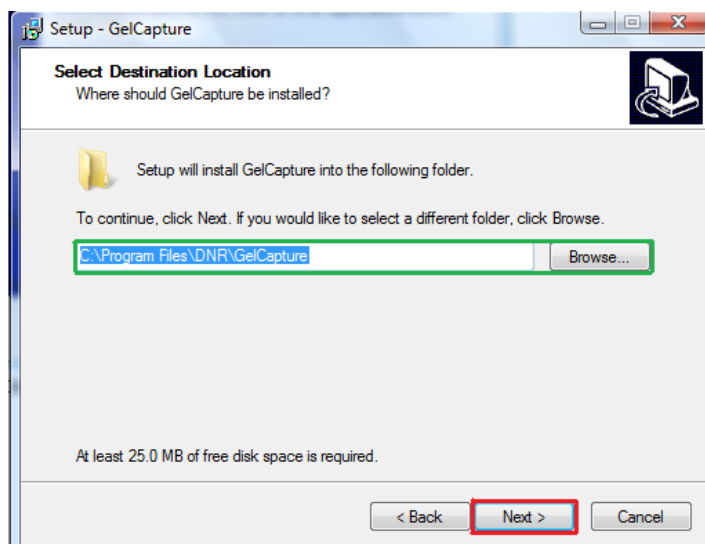
- 2 In the CD again, locate the GelCapture Vista Setup file and double click it to activate.
- 3 In the next window, select “Allow, I trust this program. I know where it's from or I've used it before” to allow the program to run.

3: Installing MiniLumi and GelCapture

- 4 Click Next.

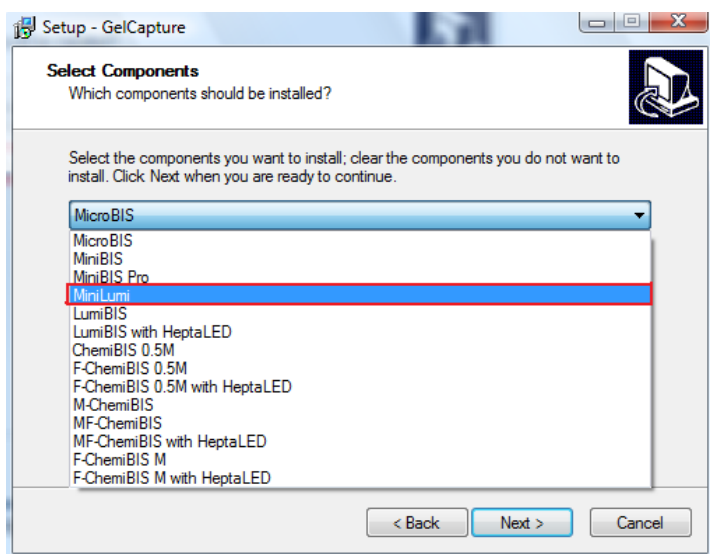


- 5 Click Next to install to the default location or click the Browse button to select a different location. Please note that selecting a different location will change all the access paths to the application settings.

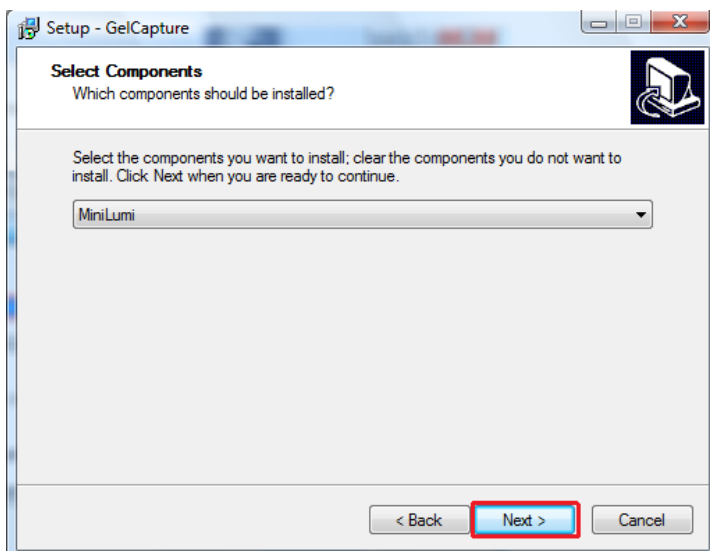


3: Installing MiniLumi and GelCapture

- 6 Click the combo box and select the MiniLumi component from the list.

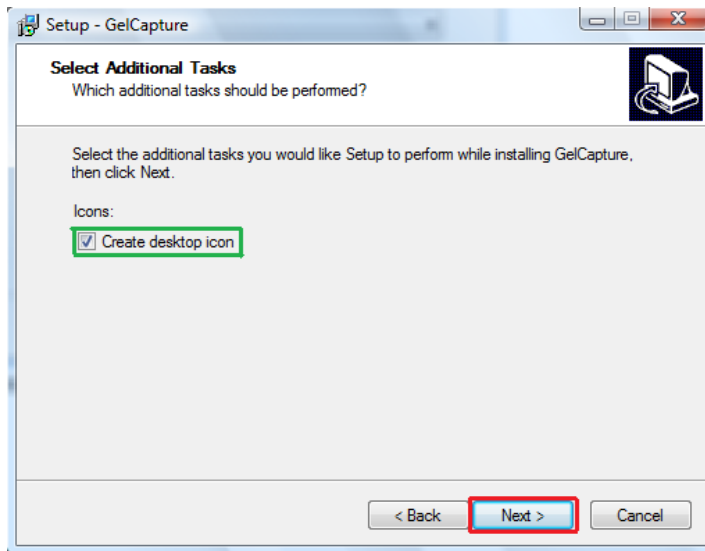


- 7 Click Next to continue installation.

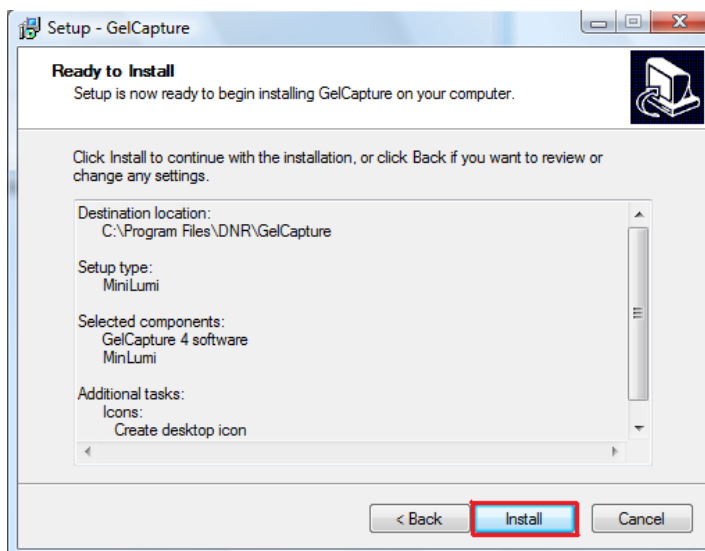


3: Installing MiniLumi and GelCapture

- 8 In the Select Additional Tasks window, choose if you want to create a GelCapture desktop icon. Click Next to continue installation.

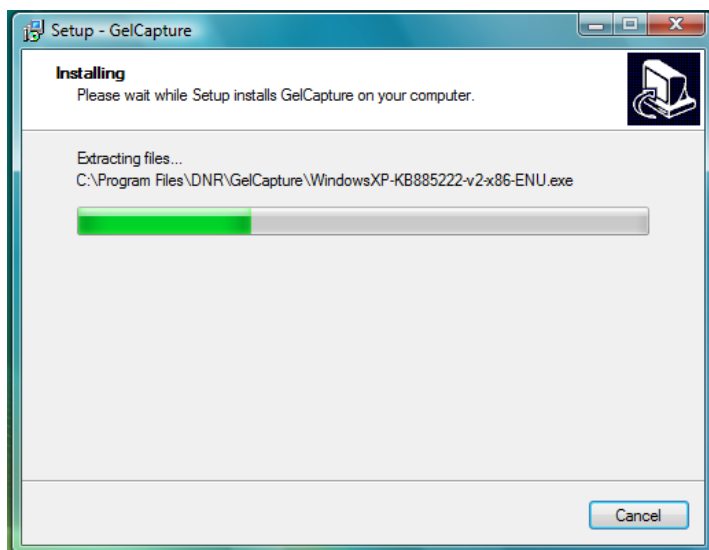


- 9 Verify that the installation information is correct before you click Install.

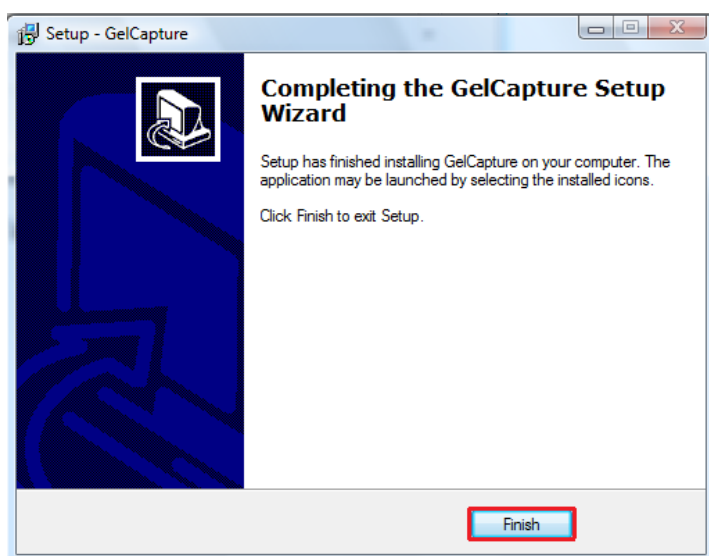


3: Installing MiniLumi and GelCapture

10 Click Install. The installation progress window will be displayed.



11 Once installation is completed, click Finish to exit Setup.



12 GelCapture Vista acquisition software is now installed on your computer.

Installing the Camera Driver (Windows XP Pro)

Once you have successfully installed GelCapture, you can proceed to install the camera driver.

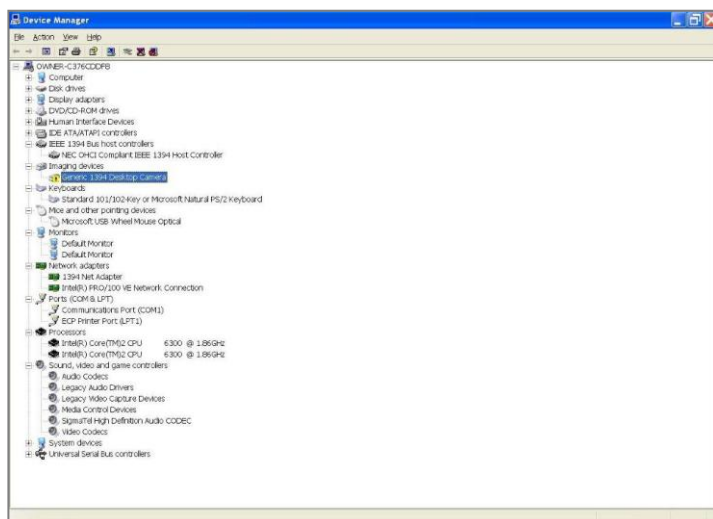
Instructions for installing the camera driver on **Windows Vista Business Operating System** are provided on page 25.

Note:

The system is provided with either the DNR MiniLumi 1.4 or the DNR MiniLumi 2.0 camera. Depending on the camera you purchased with your system you will have to choose the appropriate one wherever you are prompted to select DNR MiniLumi camera (DNR 1.4 SOM/2.0 SOM).

To Install the Camera Driver

- 1 Connect the camera to the correct PC port using the FireWire cable.
- 2 On the Desktop, right click on My Computer icon.
- 3 Select Properties. The System Properties window is displayed.
- 4 Select the Hardware tab.
- 5 Click Device Manager.
- 6 Click Imaging Devices to expand and display the list of connected devices.
- 7 Right click Generic 1394 Desktop Camera (it is preceded by a yellow exclamation mark).

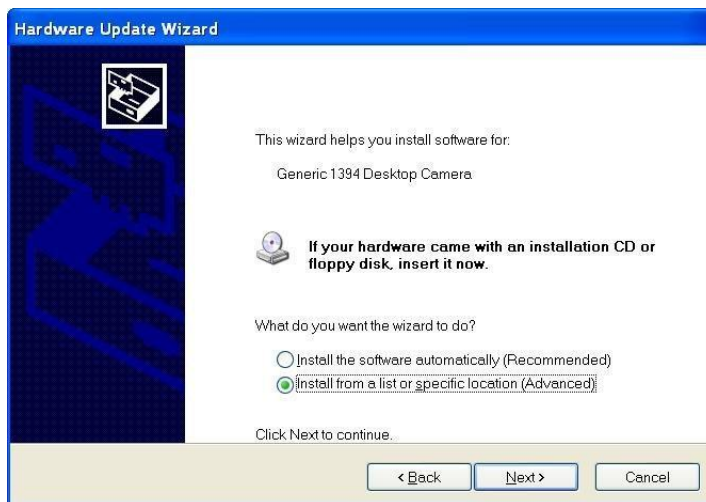


- 8 Click Update Driver.
- 9 Install the driver as follows:
 - a) In the Hardware Update Wizard window, choose “No, not at this time” and click Next.



3: Installing MiniLumi and GelCapture

- b) In the next window, select “Install from a list or a specific location (Advanced)” and click Next.



- c) Select “Don’t search. I will choose the driver to install” and click Next.



- d) Select DNR MiniLumi-1.4 SOM or 2.0 SOM and click Next.



3: Installing MiniLumi and GelCapture

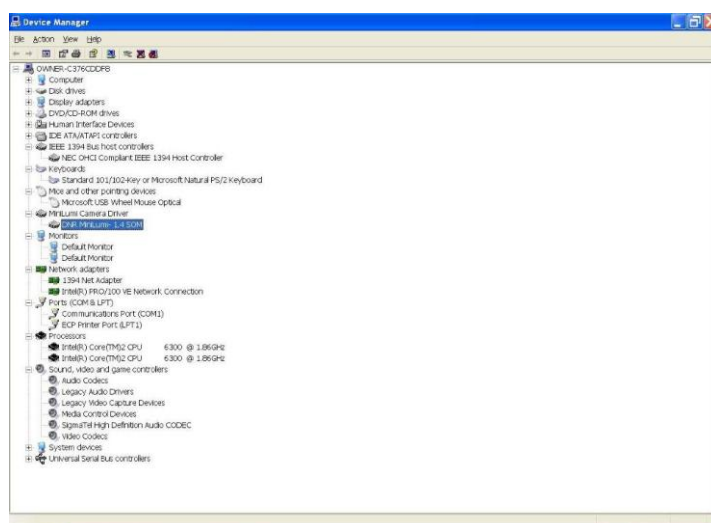
Note:

The system is provided with either the DNR MiniLumi 1.4 or the DNR MiniLumi 2.0 camera. Depending on the camera you purchased with your system you will have to choose the appropriate one wherever you are prompted to select DNR MiniLumi camera (DNR 1.4 SOM/2.0 SOM).

e) Click Finish.



10 Verify that the yellow exclamation mark is no longer displayed in the Generic 1394 Desktop Camera line.



11 The MiniLumi camera driver is now installed and ready for use.

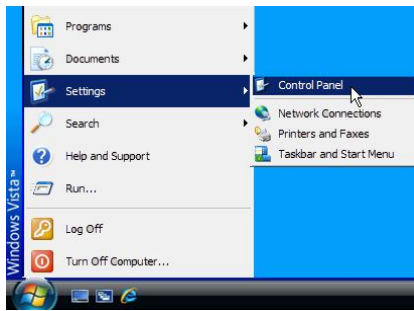
Installing the Camera Driver (Windows Vista Business OS)

Before installing the camera driver, you must first install GelCapture Vista software on your computer, as described on page 18.

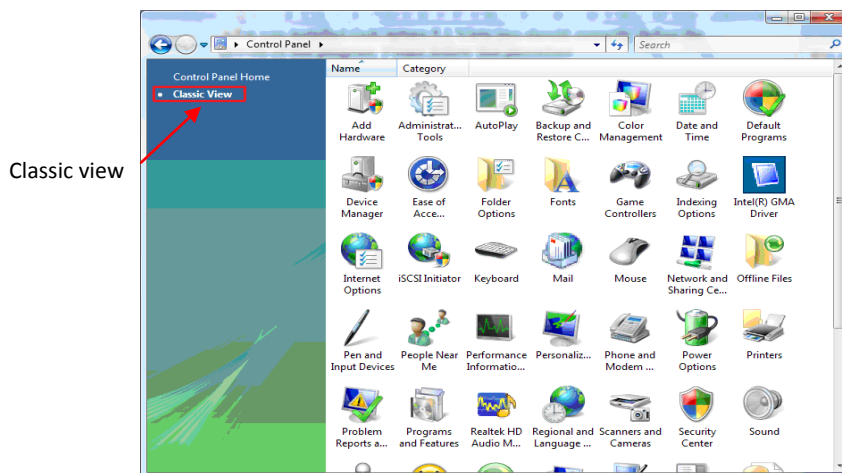
Note: Choose the camera according to the one you purchased with your system.

To Install the Camera Driver (Windows Vista Business OS)

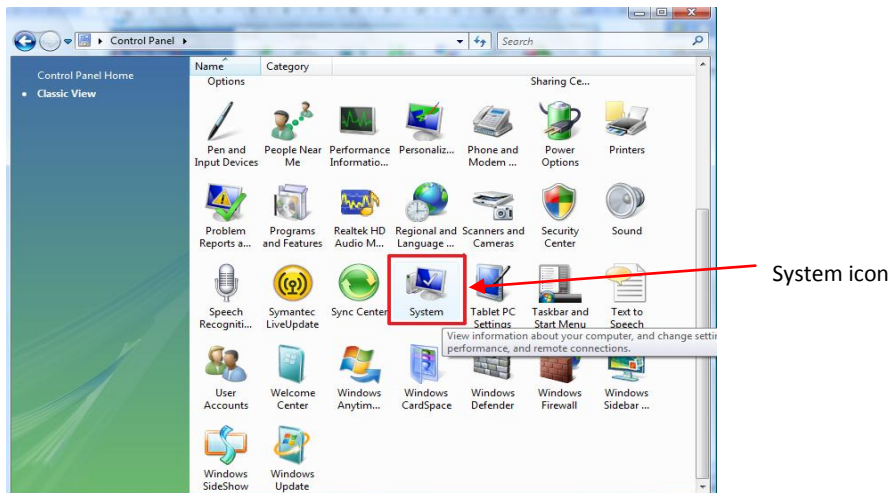
- 1 Go to Windows Control Panel by clicking Start >> Settings >> Control Panel.



- 2 Select Classic view from the left side of the window.



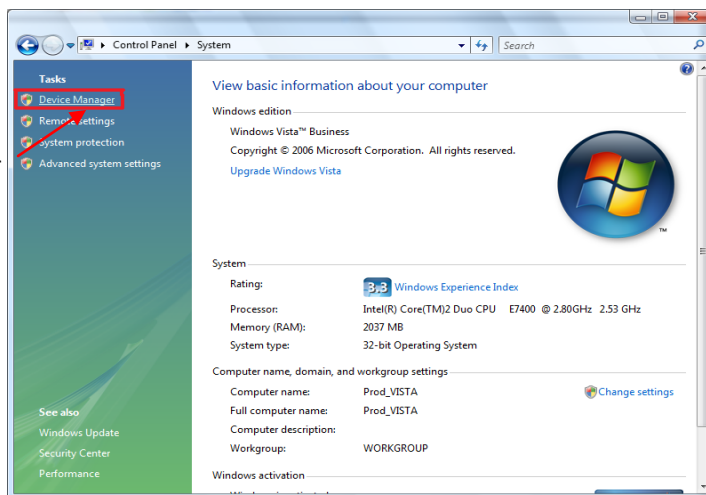
- 3 Double-click the System icon.



- 4 Select Device Manager from the left side of the window and click Continue in the next window.

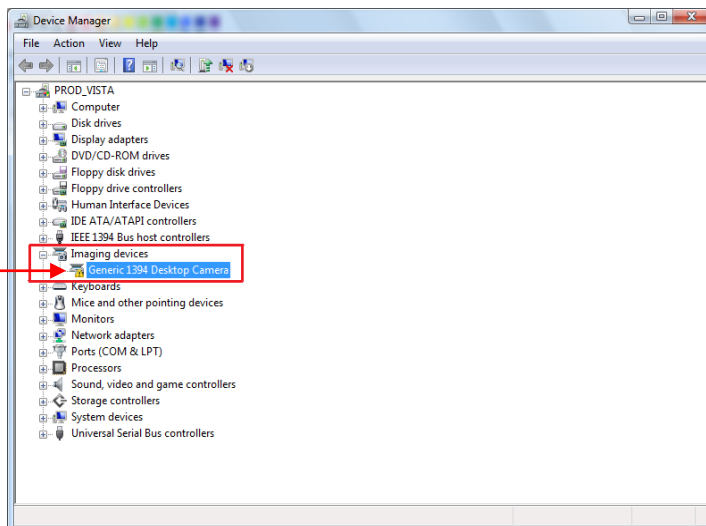
3: Installing MiniLumi and GelCapture

Device Manager

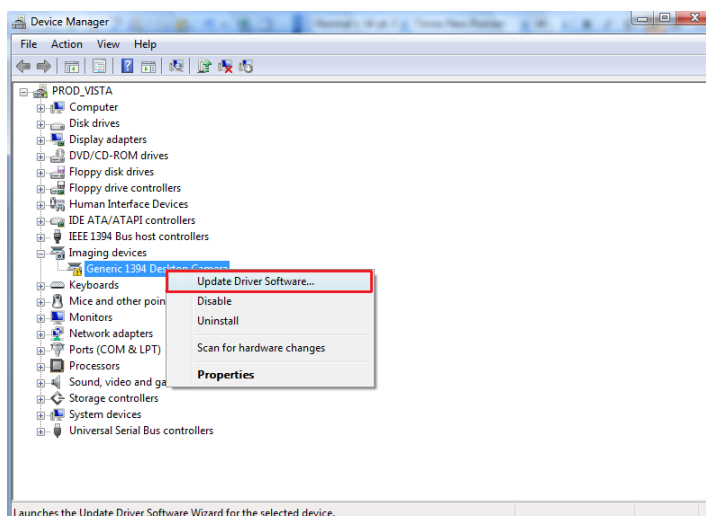


- 5 Turn your MiniLumi unit ON and connect the camera FireWire cable from MiniLumi to your computer's FireWire port. The Device manager should recognize the newly connected device and alert you.

Device
Manager
Alert

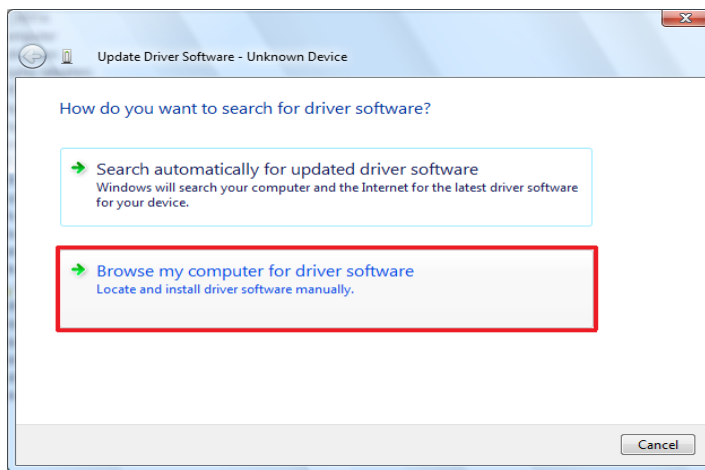


- 6 Under Imaging devices, right-click Generic 1394 Desktop Camera and select Update Driver Software.

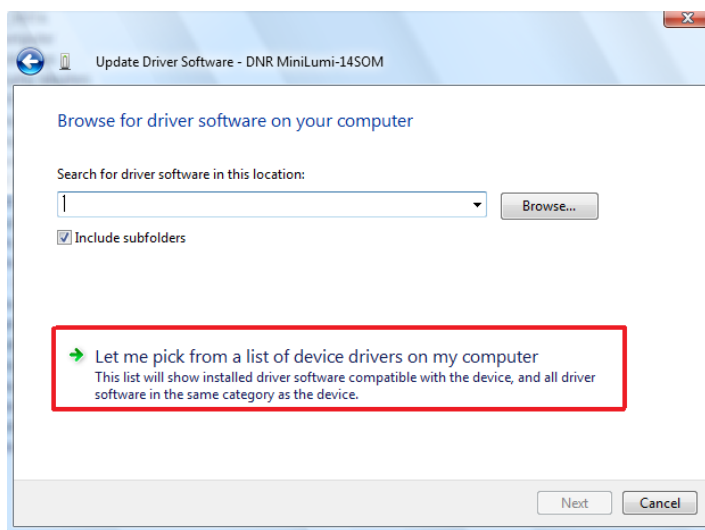


- 7 In the Update Driver Software window, select "Browse my computer for driver software".

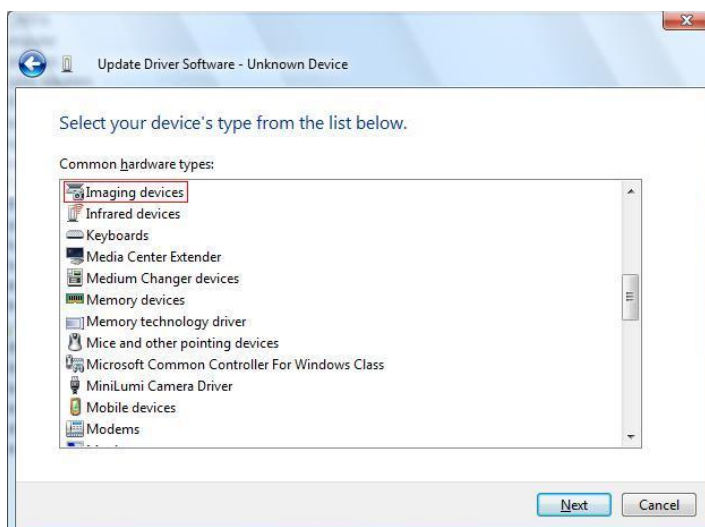
3: Installing MiniLumi and GelCapture



8 Select "Let me pick from a list of device drivers on my computer".

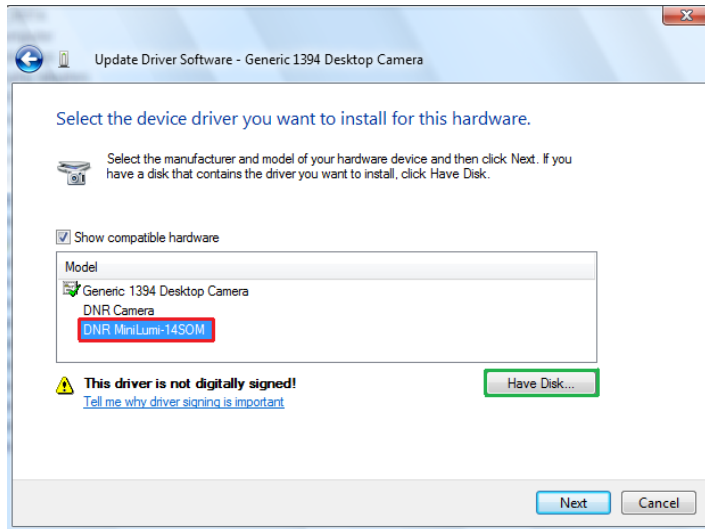


9 Select the Imaging Devices icon.



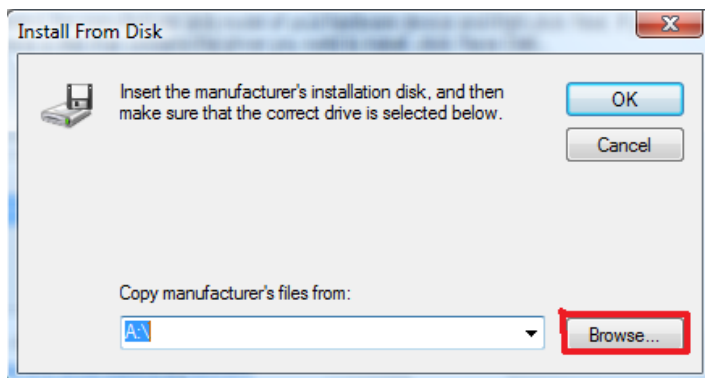
3: Installing MiniLumi and GelCapture

10 Choose DNR MiniLumi-14SOM and click on Have Disk.

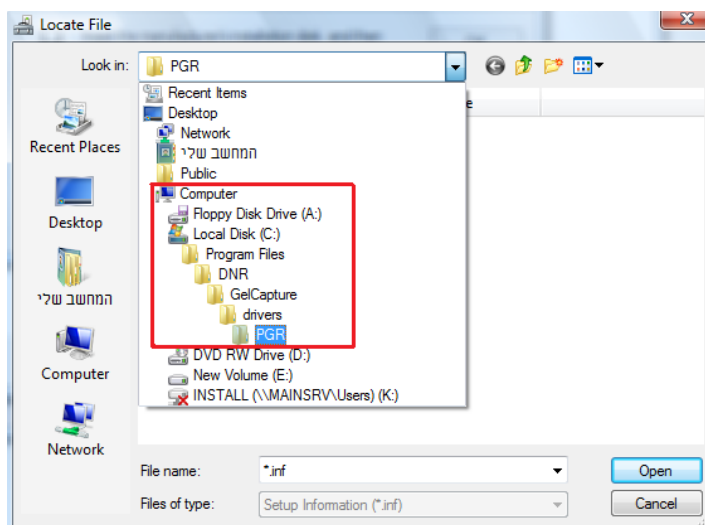


Note: Choose the camera according to the one you purchased with your system.

11 In the Install From Disk window, click Browse.

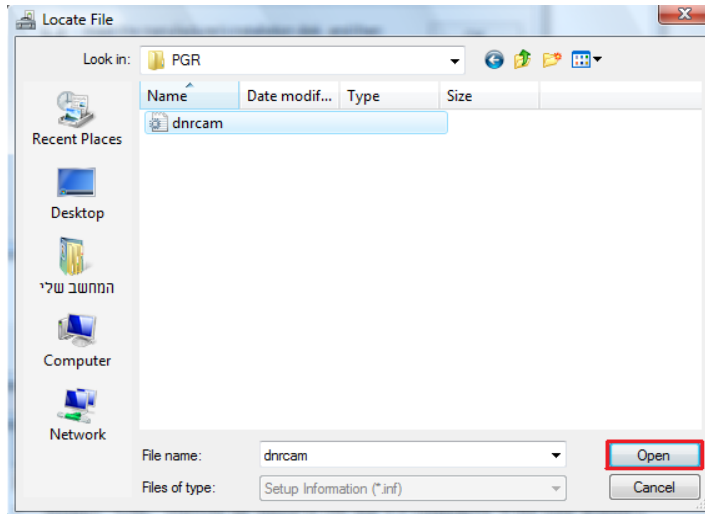


12 Browse to the following location: My computer >> Local Disc (C:) >> Program Files >> DNR >> GelCapture >> drivers >> PGR, and click Open.

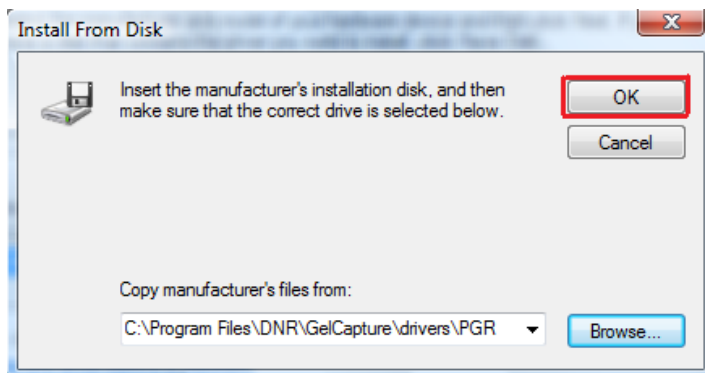


3: Installing MiniLumi and GelCapture

13 Choose “dnrcam” from the PGR file, and click Open.



14 Click OK.

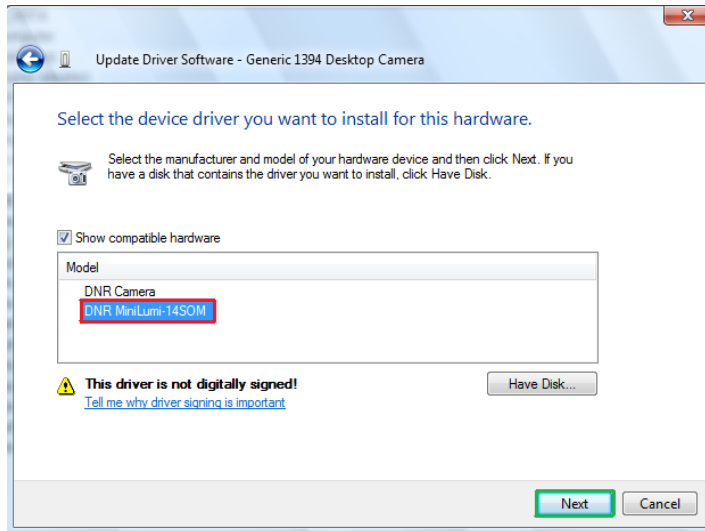


15 After successful installation, choose the option to Install this driver software anywhere.

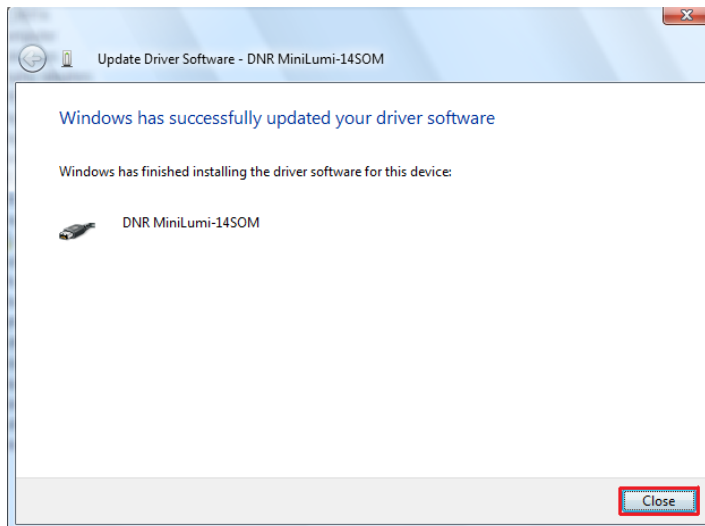


3: Installing MiniLumi and GelCapture

16 Choose DNR MiniLumi-14SOM again, and click Next.



17 After successfully completing the driver update, the successful update window will be displayed. Click Close.



18 Close the Device Manager and Control Panel windows.

19 The MiniLumi camera driver is now installed and ready for use.

Camera Calibration

After the unit and software are set up, the camera must be calibrated before it can be used. Calibration must also be performed any time a different computer is connected to the MiniLumi unit. It is also advised to calibrate the system annually, as part of preventive maintenance procedures.

To Calibrate the Camera

- 1 Open GelCapture by double clicking the desktop icon.
- 2 From the File menu, select Camera Calibration.

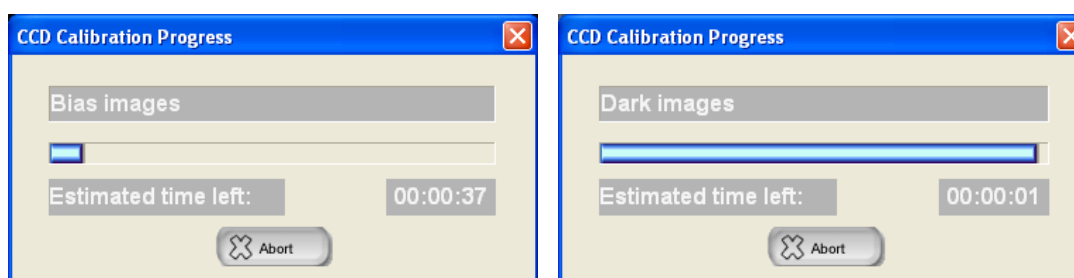
3: Installing MiniLumi and GelCapture



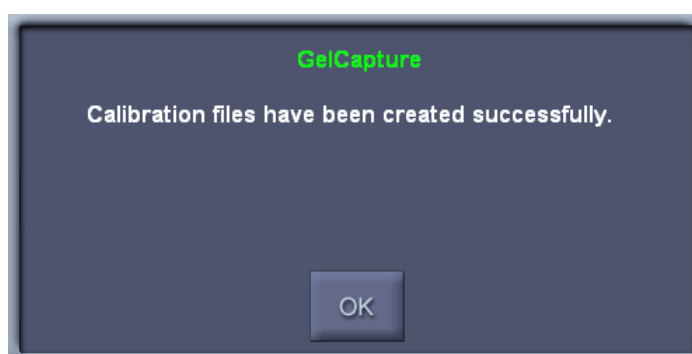
- 3 Follow the instructions in the window and click OK to start calibration.
- 4 To turn the Light Table OFF, switch the Epi UV/Trans UV switch and the Epi WL switch off, as displayed in the image below.



- 5 The CCD Calibration Progress window appears and displays the Bias images and Dark images calibration progress, while the system creates reference pictures for the CCD camera.



- 6 After calibration is completed, the GelCapture successful calibration window will be displayed.



Ready to Start

Your MiniLumi system is now set up and ready for use. The following chapter will provide detailed explanations on how to operate the system. Read the rest of this guide before using your MiniLumi unit. For your convenience, the system is provided with a Quick Reference Guide that includes the operating instructions.

4 Operating Instructions

The MiniLumi and GelCapture system lets you configure and fine tune various features to optimally capture different sample types. This chapter provides detailed explanations on how to preview, capture and save an image.

Note: The unit automatically shuts off after 5 idle minutes.

Sample Detection

The following section provides an explanation on how to prepare the system for sample detection.

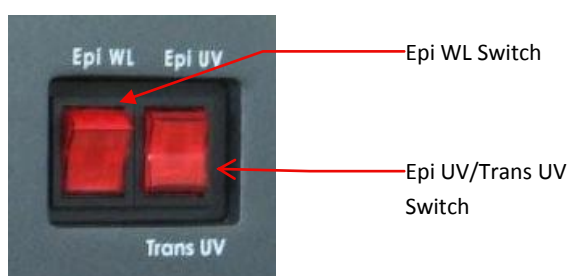
Note: The UV Drawer must be cleaned every time a sample is removed. See the section on Maintenance for cleaning instructions.

To Detect the Sample

- 1 Turn the MiniLumi unit ON (from the rear panel).
- 2 Open the MiniLumi door.
- 3 Place the sample in the center of the UV Drawer. If you pull the drawer completely out, carefully push it back into place with the sample placed on it.

Note: When working with visible dyes (CBB, Silver Stain, etc), place the yellow converter on the UV drawer and the sample on the converter.

- 4 Select the required filter in the optical bench and close the unit door.
- 5 Select the appropriate type of illumination for your experiment: Epi UV, Trans UV or Epi WL illumination.



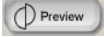
- 6 Start GelCapture.

Previewing an Image

When you preview an image, you can adjust and set several parameters, such as Iris, Focus and Zoom (at the unit) and Exposure time, Gain and Brightness (in GelCapture), in order to attain the best results. See the following section for a detailed explanation on capturing an image.

Note: Always select the illumination type from the unit's Illumination Control Panel before starting to Preview in GelCapture.

To Preview an Image

- 1 In GelCapture's main screen, click the Preview  icon.
- 2 Adjust the lens using the iris, focus and zoom controls on the MiniLumi unit. This can only be done manually using the MiniLumi lens buttons and the changes are immediately seen in GelCapture's screen.
- 3 In GelCapture, set the camera parameters: Exposure Time, Gain and Brightness.
- 4 GelCapture is now ready to save an image of the sample.
- 5 Save the image or click Preview to recapture or start with a new image. An explanation on how to save an image is provided further below.

Capturing an Image

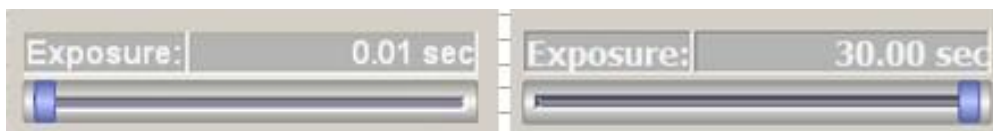
This section will describe how to use the Exposure Time, Gain and Brightness sliders.

Exposure Time

Exposure time is basically the amount of time available for the camera sensor to collect emitted light from the sample, to form an image. Therefore, increased exposure time means more time for light to reach the camera sensor to display sections of the image that were not visible with a lower exposure time.

To Set the Exposure Time

- Move the Exposure slider to the right to increase exposure time. Exposure times range from 10 milliseconds up to 30 seconds.



Gain

Gain essentially means an increase or decrease in strength of an electrical signal in a camera. Increase in gain will brighten darker areas of the image as well as any electronic background "noise". When adding gain, start at a low setting and gradually increase the gain until you are satisfied with the resulting image. Slow increments in gain will minimize any possible background image "noise". Gain setting range: 0-25.

To Set the Gain

- Move the Gain slider to the right in slow increments.

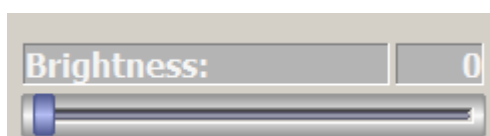


Brightness

The Brightness feature lets you display brighter images by changing the level of pixel energy detection. Increasing brightness of an image will reduce its clarity. As with the Gain feature, start at a low setting and gradually increase brightness until you are satisfied with the resulting image. Brightness setting range: 0-255.


To Set the Brightness

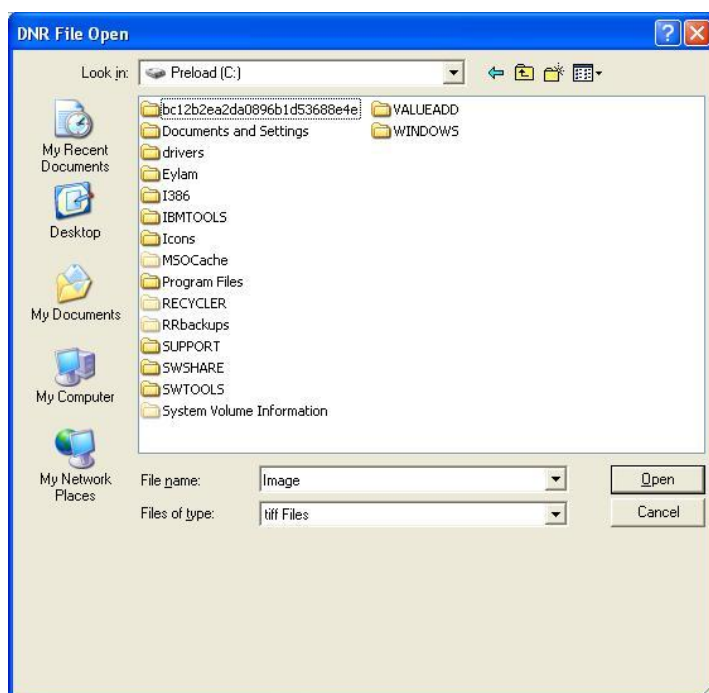
- Move the Brightness slider to the right.



Open Image

To Open an Image File

- 1 Click the Open image  icon.
- 2 Select the image to open from the DNR File Open dialog window.



- 3 Click Open.
The selected image appears in the viewing area.



Saving Features

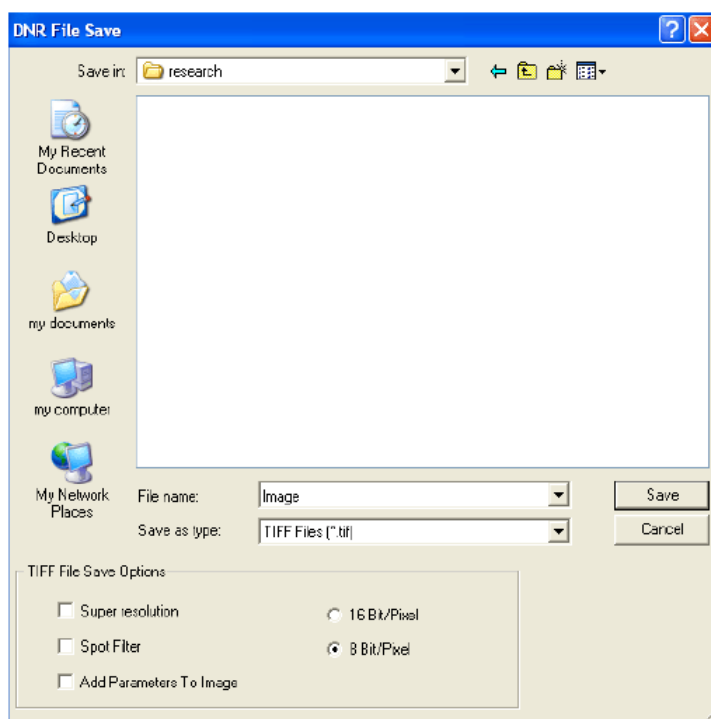
Most software programs have Save or Save As options for saving a file. GelCapture has the **Save** and **Advanced Save** features for saving images in TIFF mode, and **Save Image with Reference** for capturing images of a sample dyed with both fluorescent and visible dyes.

Saving

When you simply want to save an image, click the Save icon from the toolbar. When you need advanced saving abilities, choose the Advanced Save option. Read the following sections to learn more about saving.

To Save an Image

- 1 Detect the image in Preview mode (after setting your preferences).
- 2 Click the Save  icon or the Save  button.
- 3 The DNR File Save dialog window appears.





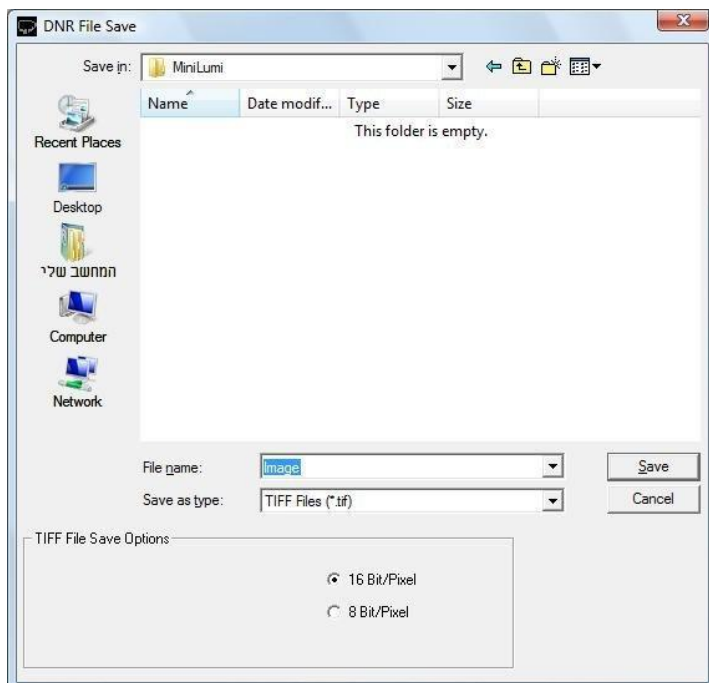
- 4 Browse to where you want the image to be saved.
- 5 Enter a name for the image in the DNR File Save window and select the required Saving Options, see page 40, for an explanation about these options.
- 6 Click Save.
- 7 The file is saved to the selected directory.

Save Image with Reference

Normally, in order to detect samples that were dyed with both fluorescent and visible (colorimetric) dyes, you would need more than one image. With the unique Save Image with Reference feature you only need to save one image of a multi-dyed sample, thus making your work more efficient.

To Save an Image with Reference

- 1 Click the Preview  icon and wait for the image to be displayed.
- 2 Click the Save Reference  icon. In the File Save window, enter a name for the image, select the required TIFF saving options and click Save.

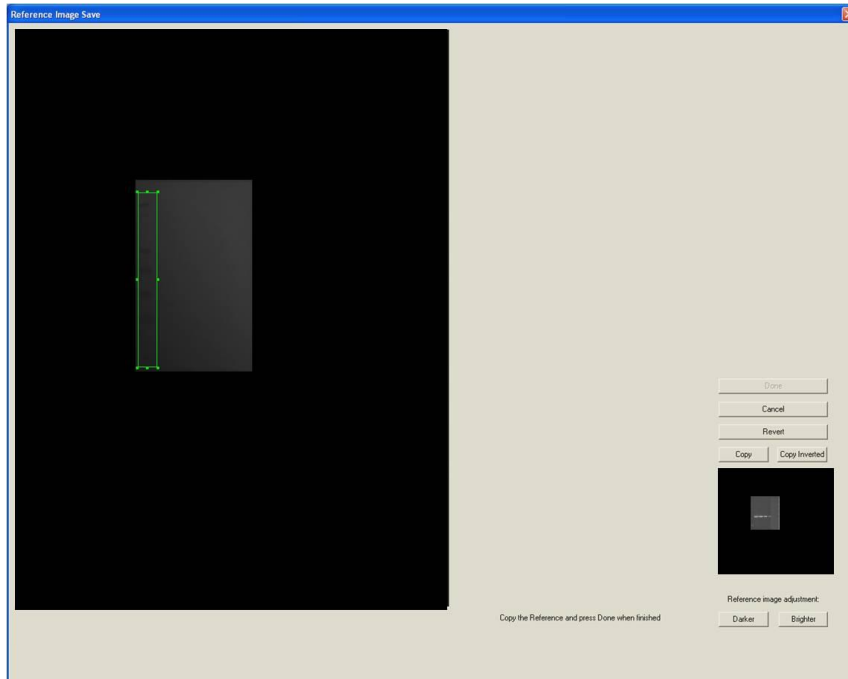


- 3 Follow the instructions in the window and click OK.

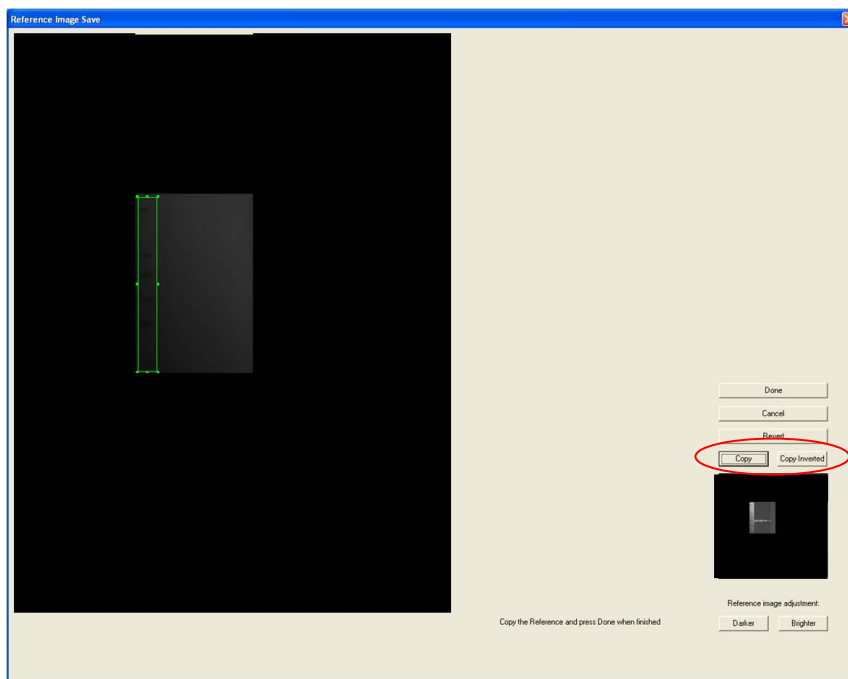


4: Operating Instructions

- 4 The following will be displayed onscreen.

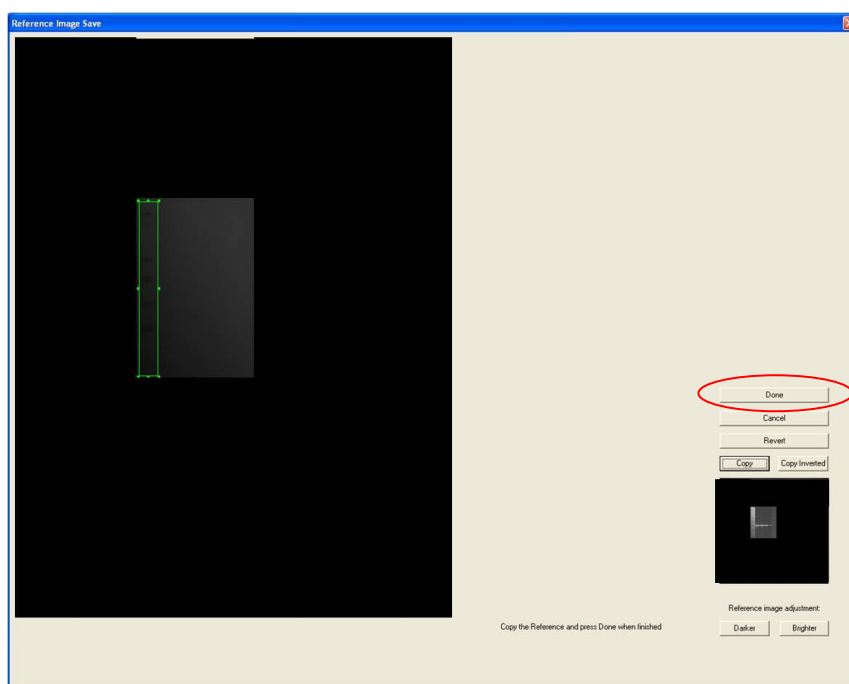


- 5 Use the adjustable green frame to select the area with the standards you want to save, choose Darker or Brighter if necessary and click Copy or Copy Inverted to copy an image reference in inverted mode.

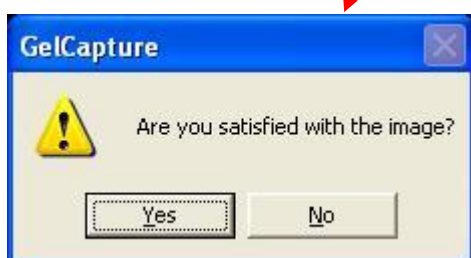
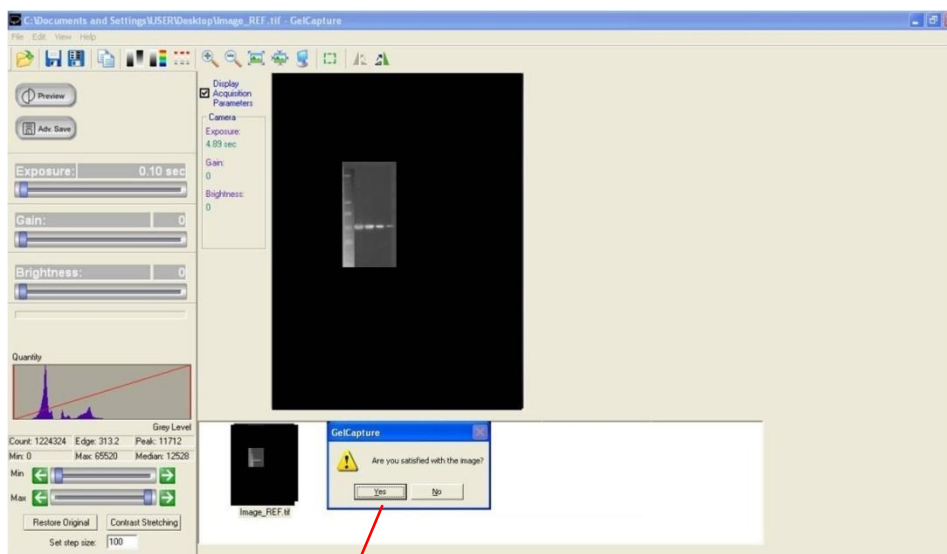


4: Operating Instructions

- Click Done to finish saving the image with reference, or click Revert to reset to the original image, or click Cancel, to cancel the entire Save Image with Reference process.



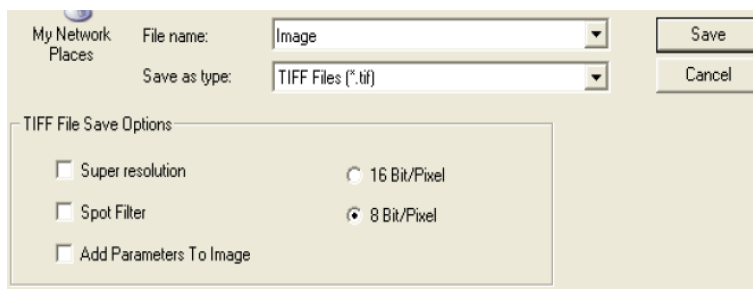
- The combined image is shown in the main GelCapture screen. A dialog box will ask you if you are satisfied with the image.



- Click Yes to continue the image merge process or click No, if you would like to edit standards of the image.

Saving Options

In addition to saving the image according to your settings, GelCapture lets you define additional saving parameters, which are selectable from the DNR File Save window.



Select from the following options:

- **Super resolution:** Increases the image resolution by four-fold (by software)
- **Spot Filter:** Decreases “grainy gel” phenomenon
- **Add Parameters To Image:** Adds camera acquisition parameters to the image
- **16 or 8 Bit/Pixel:** Saves the image in 16 or 8 bit TIFF format

Advanced Save with Hardware Integration

In addition to the standard saving feature, GelCapture is equipped with a unique feature for advanced saving. Advanced Save enables you to capture a sequence of images using Hardware Integration.

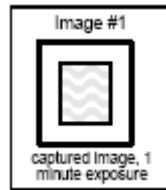
Hardware Integration captures and displays a series of images with different exposure times. It captures each image for the full amount of time specified and allows as many photons of light, which are emitted from the sample to hit the camera sensor. This can be especially helpful if you are not sure of the ideal exposure time or if you want to detect kinetic experiments.

4: Operating Instructions

See the diagram below for an explanation on the Hardware Integration process, using 1, 2 and 3 minutes exposure times.

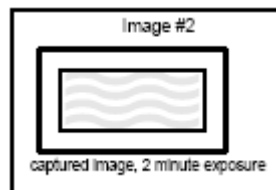
Hardware Integration

Image #1
1 minute
exposure time



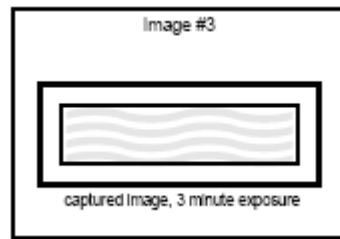
The image is captured for one minute

Image #2
2 minute
exposure time



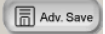
The image is captured for 2 minutes

Image #3
3 minute
exposure time

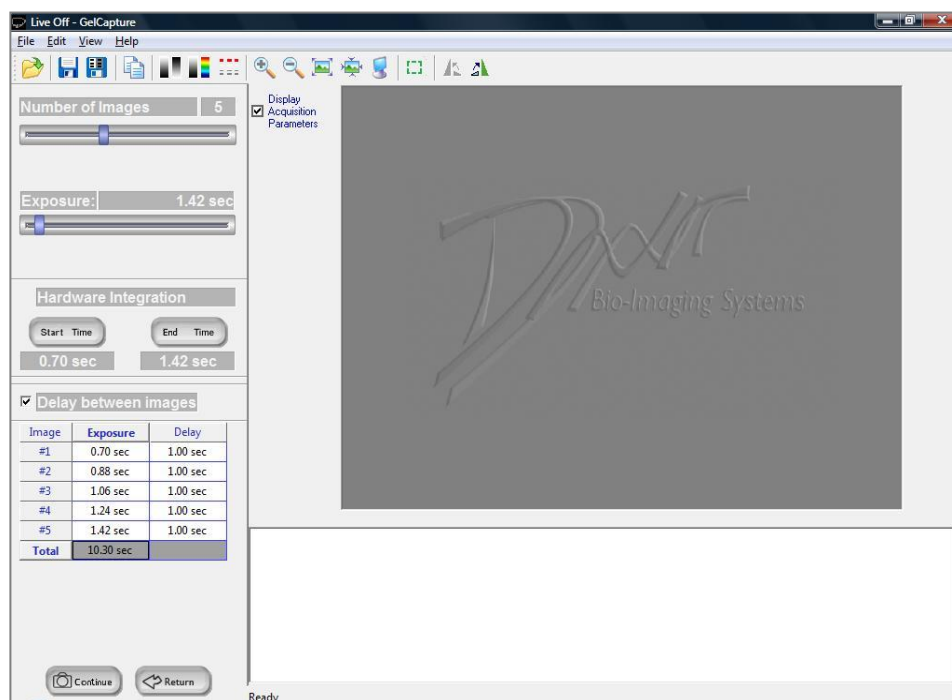


The image is captured for 3 minutes

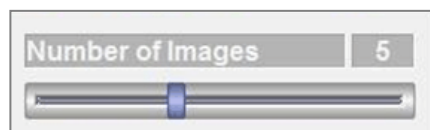
To Set up Advanced Save with Hardware Integration

- 1 Click the Advanced Save  button.

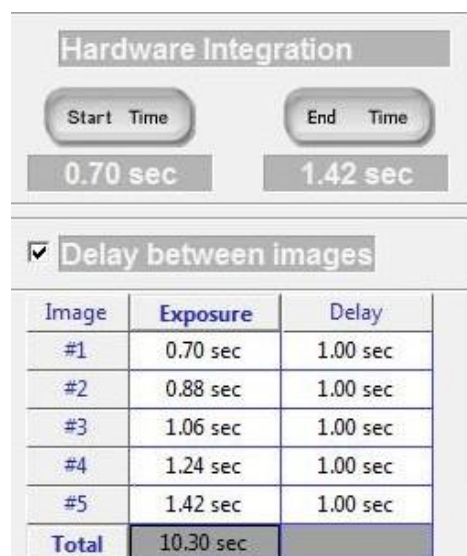
The Hardware Integration settings will be displayed on the left.



- 2 Use the Number of Images slider to select the number of images required.



- 3 Set the Exposure time slider to the preferred starting time and click Start Time on the left. Our example uses 0.70 seconds for the Start time of the first image, 0.88 seconds for the second image, 1.06 seconds for the third and so on.

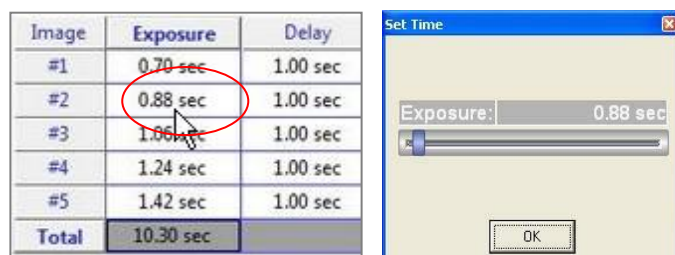


4: Operating Instructions

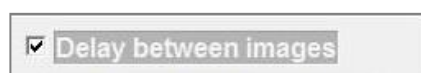
- 4 Set the Exposure time slider to the preferred ending time and click End Time on the right.
- 5 Our example shows an End Time of 1.42 seconds for the last image in the process.



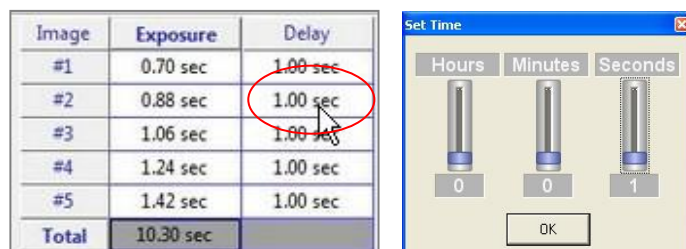
- 6 After setting the exposure times for all the images in the series, you can then change the exposure time for a specific image by left clicking the Exposure box for that image.



- 7 Check the Delay between images box if you want to add a time delay between images.



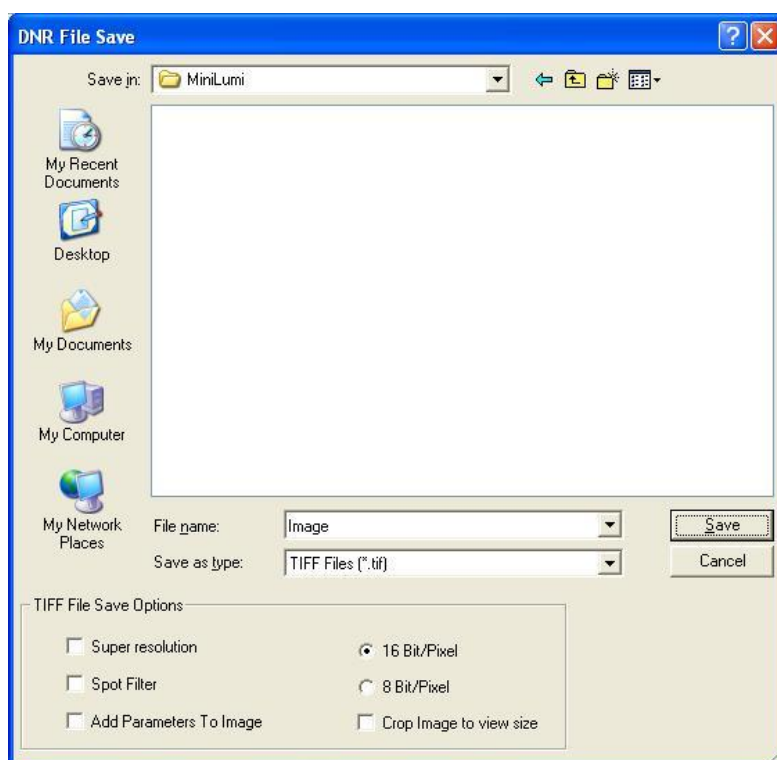
- 8 After the box is checked, you can change the delay of any image by left clicking the Delay box of that image.



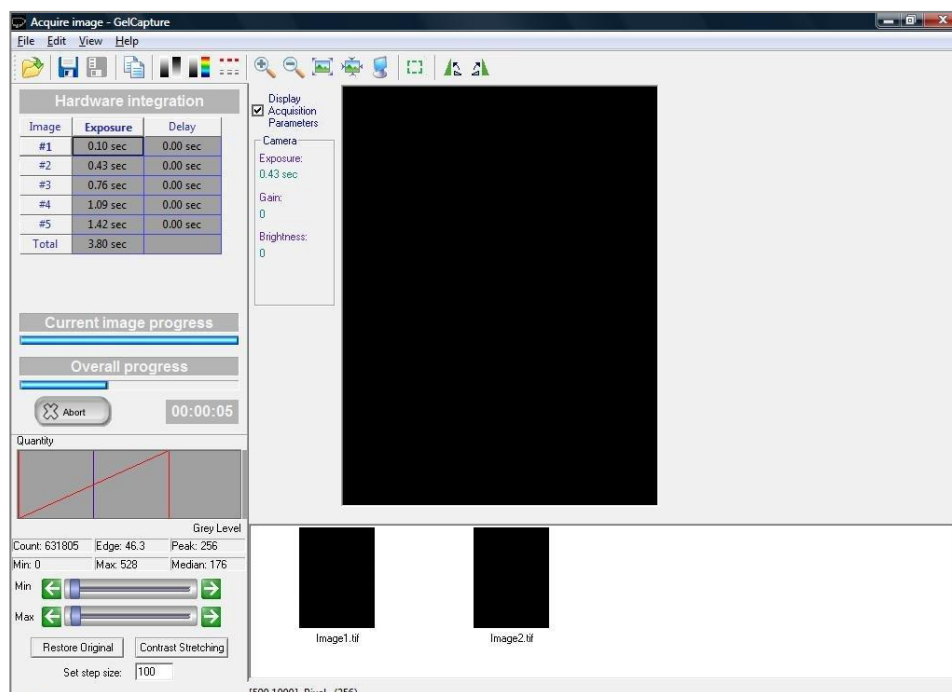
- 9 Click the Continue  button in the bottom left of the screen.

4: Operating Instructions

- 10 The DNR File Save window will be displayed. In the Save As dialog box enter a name for the image and select the preferred TIFF File Save Options.



- 11 GelCapture will begin to capture and then save the image according to the defined settings. Capturing progress and other parameters are displayed in the lower half of the screen.



- 12 Click Abort if you would like to stop running the process.
- 13 Click Return to go back to GelCapture's main screen.

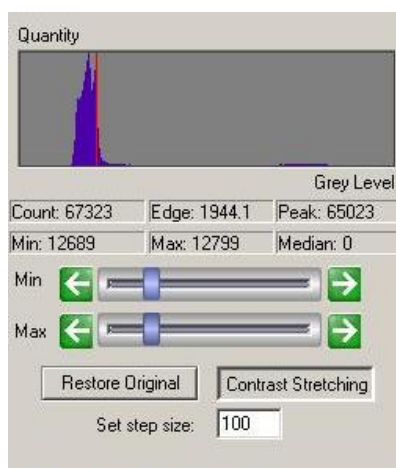
Imaging Tools

GelCapture provides you with several imaging tools to alter the appearance of an image when portions of the image are too dull or too dark, thereby making it unclear. Use the Inverted Image, Pseudo-color and Overexposure settings to assist you in examining the quality of the image before sending it for analysis.

When you use Imaging Tools to make changes and then save the image, the image is saved with its original information. However, when the image is reopened in GelCapture, the changes you made and saved are displayed. For example, if you invert an image and then save it, the next time you open the image in GelCapture, the image appears inverted. However, if you open the same inverted and saved image in other image analysis software, the image appears as it did when you originally captured it, i.e. not inverted. Read the following section to learn more about Imaging Tools.

Image Statistics Graph

The Image Statistics Graph provides you with an illustrated version of the image data to help you capture images optimally. When you Preview an image, the Image Statistics Graph is displayed on the left. Other information is displayed below the graph.



Quantity	Gray level amount
Gray Level	Gray level type (0 - 65,535).
Count	The number of gray levels in the image.
Edge	Refers to image sharpness.
Peak	The grayscale value with the highest number of pixels.
Min	Indicates the lowest reading in the statistical curve.
Max	Indicates the highest reading in the statistical curve. A maximum of 65,535 indicates the highest rating.
Median	The median grayscale is the value in the exact middle between the maximum grayscale and the minimum grayscale of the image.
Min/Max sliders	Manually change the image stretch level by clicking the right or left green arrows or by moving the slider. Moving the Min/Max sliders will result in different image Min/Max gray levels.
Restore Original	Restores any stretching actions to the original image values.
Contrast Stretching	Auto increase the stretching of the image. This option helps reveal low concentrations of biological samples in the gel.
Set step size	Control the step size of each click on a given Min/Max slider arrow by setting the step size to a value between 1 and 1000.

Inverted Image

Inverted image inverts the color scale, i.e., light areas appear dark and dark areas appear light, much like a negative. This feature is particularly useful when you need to decipher close bands.

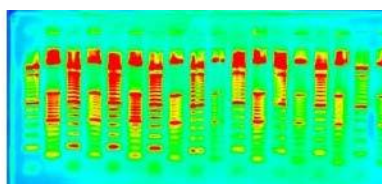
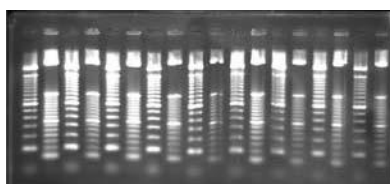
To Invert an Image

- 1 Click the Invert Image  icon.
- 2 Click the icon again to revert to the original view of the image.


Pseudo-color

Pseudo-color lets you view an image in one of two ways:

- 1 One color, such as orange, green or blue; similar to the actual color of the sample. For example, samples dyed in Coomassie Brilliant Blue are colored blue with pseudo-color.
- 2 Color spectrum, indicating the “hot” and “cold” areas of the image. In this mode, the colors are based on the image’s grayscale where red refers to the maximum and blue refers to the minimum grayscale levels.

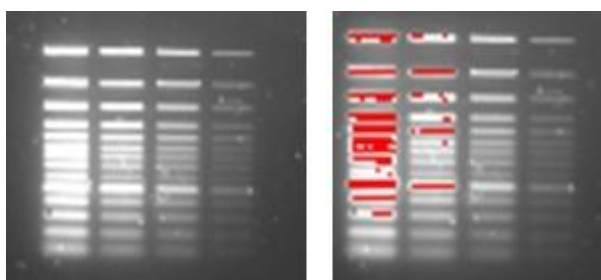


To View an Image in Pseudo-color


- 1 Click the Pseudo-color  icon.
- 2 Click the Pseudo-color icon again to revert to the original view of the image.

Overexposure

Overexposure occurs when the camera lens receives too much light, which usually results in white or bright areas that will produce faulty analysis results. Therefore, as soon as you detect an overexposed area in a sample you intend to send for analysis, you should decrease the light intensity, by closing the iris, reducing the gain or reducing the brightness, etc. The GelCapture Overexposure tool displays overexposed areas in red.




To View an Image Using the Overexposure Tool

- 1 Click the Overexposure  icon.
- 2 Click the Overexposure icon again to revert to the original view of the image.

Region Of Interest (ROI)

The ROI feature lets you perform various actions on a specific area of the sample either in Preview mode or in a saved image. In Preview mode you can save, copy or view the histogram of the selected area. With a saved image you can also crop and revert.

To Define a Region of Interest

- 1 In Preview mode or in a saved image, click the ROI  icon.
A green frame will appear on screen, as seen in the image below.
- 2 Adjust the image size or position. You can either stretch the pivot points on the frame or mouse-left click and drag down to open a new frame of a region of interest.

4: Operating Instructions

- 3 Point the mouse anywhere within the green frame and right click to display the menu options.



5 Troubleshooting

Before you contact support, it is recommended that you read over this section to see if you can resolve the problem by yourself. To make this as easy as possible, we have created a list of the most common problems and their possible solutions.

The camera is not recognized after turning MiniLumi on.

Possibly, due to an improper camera FireWire card/cable connections.

- Verify that the FireWire cable is stable in the appropriate PC port.

My captured images are extremely fuzzy or blurry.

Possibly, due to faulty camera and lens adjustments or improper illumination and filter settings.

- First, adjust the zoom according to the sample size, then adjust the iris and focus settings.
- Be sure that the illumination source and the chosen filter are appropriate for the examined sample dye.
- Check the viability of the lamp: if the bulb edges are black, the bulb must be replaced.

The images taken with my MiniLumi are very dark.

Possibly, due to improper camera and lens settings or improper filter or illumination settings.

- Open the Iris.
- Increase the exposure time.
- Verify that the illumination source and filter settings are appropriate for the examined sample.

The image is partially black.

Possibly, the filter wheel is not positioned properly.

- Rotate the filter wheel to the proper position.

6 Glossary

CCD

A charge-coupled device (CCD) is a light-sensitive integrated circuit that stores and displays the data for an image in such a way that each pixel in the image is converted into an electrical charge with intensity relative to a gray level in the grayscale. The MiniLumi system has a black and white sensor with 65,536 gray levels, so there will be a separate value for each gray level that can be stored and recovered. CCD is one of two main types of image sensors used in digital cameras to create high-quality, low-noise images.

Dynamic Range

Dynamic range is the range that a sensor is capable of differentiating. If the sensor can differentiate between two points in an image, then each point is translated into a pixel of the image; if the sensor is unable to differentiate, then the two points will be pixels of noise. Dynamic range is also referred to as Signal to Noise Ratio (SNR).

Exposure Time

The length of time light passes through the lens to form an image.

Fluorescence

A process by which a fluorescent molecule is excited at one wavelength and triggers the emission of a photon with longer (less energetic) wavelength; making it possible to detect, image, and measure the amount of fluorescence in samples as small as individual cells, and with multiple fluorescent colors.

Gain

A camera feature that increases or decreases the strength of an electrical signal. When the gain is increased brightness also increases, and so does any electronic “noise”. This results in a brighter image with less clarity.

Iris

A mechanical diaphragm that adjusts the lens aperture; with high levels of illumination, the iris should be minimized; with low levels of illumination, the iris should be maximized.

Pixel

A pixel, or picture element, is the basic unit that the camera uses to build an image. Image size is also measured in pixels.

Pseudo-colors

Using pseudo-colors to color an image artificially can reveal textures and qualities within the image that may not have been apparent with the original coloring. Essentially, the pseudo-color module populates the image based on its grayscale value, which maps to the full RGB color range. Therefore, red and yellow (warm colors) indicate oversaturated areas, and blue (cold color) indicates under-saturated areas in the image. Green indicates midrange levels.

Resolution

The amount of detail that the camera can capture is called the resolution, and it is measured in pixels. The more pixels a camera has, the more detail it can capture.

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